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ABSTRACT

This guide to multi-image program production for practitioners describes the process from the beginning stages through final presentation, examines historical perspectives, theory, and research in multi-image, and provides examples of successful utilization. Ten chapters focus on the following topics: (1) definition of multi-image field and state-of-the-art; (2) history of multiple image in visual arts and research trends; (3) strengths of medium, audiences, and applications in education, business, and industry; (4) organization techniques simultaneous operation of audio and visual components, and physical arrangement of site and equipment; (5) planning and writing the program, with emphasis on design objectives, scripting, and assemblage of audio and visual portions of a storyboard; (6) organization of visual formats, production, composition of visual images, and specific production techniques; (7) physical characteristics, production and recording techniques of audio components; (8) programming of the presentation and background on types of programmers; (9) planning of environment and organization of materials; and (10) methods for critical evaluation of a presentation and explanation of the impact of functional/experimental criticism. Included are appendices of source lists for manufacturers of program control devices, audio recording and playback equipment, related equipment, and multi-image information sources. (CWM)

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The Art of Multi-Image

Edited by Roger L. Gordon

416

Special Editing by A. Arvo Leps

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1978

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FOREWORD

by Wilson Brydon

Multi-Image, whether viewed as an art form or as a technology, is a medium with a future. It is however, a medium with a future only if we, who are a part of it, consider our primary contribution to be one of developing multi-image's own unique characteristics and capabilities; searching out and exploring its special potentialities. If, on the other hand, we are shortsighted enough to utilize its increasingly sophisticated technology merely to duplicate an existing medium (i.e. motion pictures), then we will end up only re-inventing what Mr. Edison and others have already made possible. I like to think that we are in the process of evolving a new medium, a new way of expression, a new way of reaching across the communication gap that still separates one human being from another. Let us, therefore, look forward, not backward, in our developing use of multi-image. If we do, then, like Columbus, we may have discovered more than a new way to an old world; we will, indeed, have come upon a whole new world.

Since the beginning of the Association for Multi-Image approximately five years ago, we, its officers, have been repeatedly asked to publish an all-inclusive book covering not only production techniques for multi-image presentations, but also information about research in multi-image, historical perspectives of the field and examples of successful utilization. The result is this book, which represents the work of many people who are members of the Association for Multi-Image. It has been in production for over two years.

As with any large project, we considered many possible procedures. We decided that our best approach would be to ask varied contributors to write specific chapters in their areas of greatest expertise. It is difficult to coordinate such work since there are varied approaches to the art of multi-image. But after considerable planning, correspondence and revision, a definite outline for the book was conceived and chapters were assigned to the authors. In every case, we searched for persons with experience in the specific areas of production, planning, and writing of multi-image programs, organization, technical areas, and historical and research perspectives. Overall editing and production responsibilities for the book fell into the hands of the editor.

The consumers of this book should be many. We hope that it can be used as a textbook in schools, colleges and universities where multi-image design and production courses are taught. We hope that the book can also be used as a reference tool for people with experience in multi-image. It could serve as a beginning resource for scholars doing research in the field. The book should also be helpful to producers in business and industry who have varied responsibilities for multi-image.

One of the greatest stumbling blocks for multi-image seems to lie in the absence of reproducible evidence about whether this medium can better teach information than alternative methods and whether it can do so efficiently. For this reason, most of the available specific research information has been included. This kind of research, while often cited in piecemeal fashion in journals and trade publications, has to our knowledge never been fully compiled, as it is in this publication. We expect that this kind of information will continue to grow as the discipline grows and that both more comprehensive as well as detailed research will be carried on and disseminated. This no doubt will be the emphasis of future publications by the Association for Multi-Image. We have also made every effort not to date the information in this book. Of course, inevitably, in this fast growing field, some dating will take place.

Chapter I sets the stage for what is to come. It defines the field generally and differentiates between the terms multi-media and multi-image. It describes the state of the art of multi-image today. This chapter has been jointly written by Roger L. Gordon, Professor of Educational Media at Temple University, Philadelphia, PA and Robert C. Wiseman, Chairperson, School Service Personnel, Eastern Illinois University, Charleston, Illinois.

Chapter II concerns the broad history of the field as well as an overview of the research that has been accomplished in the relatively short lifetime of multi-image. It has been written jointly by Ken Burke of Southern Methodist University, Dallas, Texas and Bernard Fradkin of Evergreen Valley College, San Jose, California.

Chapter III attempts to answer the question: why do we use multi-image presentations? It cites strengths of the medium, specific applications and audiences for multi-image and defines how these kinds of presentations can be utilized in education, business and industry. It has been jointly written by Palmer E. Dyer, Professor at the School of Communications, Ithaca College, Ithaca, New York and Ron Slawson, faculty member at Santa Fe Community College, Gainesville, Florida.

Chapter IV describes the elements of the multi-image program. It offers an overview of what will be covered in greater detail in the chapters that follow, pointing out how the audio and visual components work in concert in a multi-image production. The chapter also desctibes the physical arrangement of equipment and site for maximum utilization of the potentialities in the presentation and offers techniques for organizing the production. Part I of this chapter has been written by JoNell Campbell, Director of Media Productions at Southwest Missouri State University, Springfield, Missouri and the already mentioned Ron Slawson has written Part II.

Chapter V concerns the planning and writing of the multi-image program from the standpoint of design objectives, the actual scripting of the program, and the assemblage of the audio and visual portions of a storyboard. It has been written by Palmer E. Dyer, mentioned earlier.

Chapter VI offers both a detailed description of organizing the formats of the visuals as well as the actual production of the visuals. It covers the composition of images for the visual portion of the program as well as suggesting specific production techniques. This chapter has been written by A. Arvo Leps, a doctorial candidate in education at UCLA in Los Angeles, who also works as an independent producer/consultant, and by Hans-Erik Wennberg, Assistant Director, Audio Visual Department, Rhode Island College, Providence, Rhode Island.

Chapter VII follows sequentially by covering the production techniques for the audio component of the program. It has been written by the previously mentioned Ken Burke. The next step in the production of a program is discussed in Chapter VIII which concerns the Programming of the Presentation. It describes the basic types of programmers, offers a historical background of the evolution of these devices, and helps the reader to choose what he or she needs. This chapter has been written by James W. Hulfish, Jr., Director of Marketing of the firm of Spindler & Sauppe' in North Hollywood, California

Chapter IX describes the many challenges faced by multi-image producers in actually presenting a program. It covers the fixed installation within a building and warns us of the problems inherent in "road showing" a presentation. The author is Carl Beckman of the firm of Beckman Associates.

Chapter X is a somewhat philosophical study of methods for critically evaluating a multi-image presentation. It suggests various evaluation tools as well as explaining the impact of functional/experiential criticism. It also has been written by Ken Burke.

The book contains a number of appendices concerning source lists for manufacturers of program control devices, audio recording and playback equipment, related equipment, and sources of information about multi-image. The general bibliography has been prepared by Donald Pasquella, Associate Professor at the Division of Broadcast-Film Art, Southern Methodist University, Dallas, Texas as well as Ken Burke.

Much of the critical reading, editing, as well as some revision of the manuscript has been done by A. Arvo Leps of Los Angeles, California, whose time consuming work has contributed substantially to this volume.

Other editing work has been done by Ken Burke whose overall contributions to this book are self-evident.

Further credit for this publication goes to the home office of the Association for Multi-Image headed by Mr. William H. Evans. Others at the home office whose help has been invaluable include Ford Robinson, Priscilla Metzger, Mary Clark, Marilyn Kulp, Rita Schmidt and Edith Evans. A special vote of thanks goes to Drew Deacon for his precise editing of the manuscript. The staff of Delso Services, led by Bob Evans, also has played a major part in this book. They include Shirley Lawson, Hugh Hockemeier, and Catherine MacIntyre. The artwork and paste up of the manuscript was done by A. J. Neve. The printer was Leonard McCleary. Thanks also go to all the others who have had a hand in this effort. Credit is also due to all the very cooperative manufacturers of multi-image hardware who not only have heartily supported the entire project but have given permission for the use of many valuable resources. A special thanks to Bob Rowan and his staff at the University of South Carolina, who designed the artwork for the cover of this book.

Finally, our thanks to the Board of Directors of the Association for Multi-Image whose support made the entire project possible.

Roger L. Gordon
Editor

THE ART OF MULTI-IMAGE

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CHAPTER I
WHAT IS THE MULTI-IMAGE PRESENTATION?

Robert C. Wiseman and Roger L. Gordon

You are about to enter the exciting and creative world of multi-image. This book has been carefully constructed not only to give you information about the production of multi-image presentations, but also to provide insights into the kinds of impact these programs can have in education, business, and industry.

The title of our initial chapter presents a question that is often asked. Just what is the multi-image presentation? Is it a mixture of still and motion pictures flashing on and off on a number of screens in a large dark auditorium? Is it a technique to mesmerize an audience? Is it a show? Does it entertain, and/or does it educate? Just what is it and what does it do?

The pages that follow should provide more than enough answers to these and other questions relating to the art of multi-image. But like anything else, the reader will have to make up his own mind on how multi-image presentations fit his individual objectives. Today advocates of this fast growing art form often raise many questions about how multi-image presentations can be produced and utilized. Quite often it seems that when any of these questions are answered, other questions regarding methods for distribution, storage and retrieval of programs crop up. No doubt, like during the early days of railroading when the optimum width for the track was being debated, future standards for multi-image presentations are a further concern for serious practitioners.

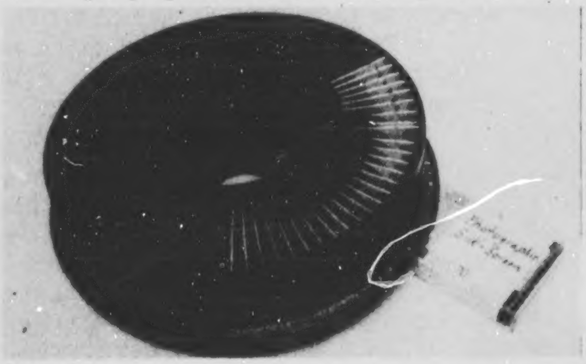
To begin to provide answers to these and other questions, as well as to promote the art of multi-image, has been the major emphasis of the Association for Multi-Image, (AMI). The association is a professional organization composed of people from education, business, and industry, as well as from other facets of our community who have joined together in an attempt to make use of the unlimited potential of this fast-growing art form.

Terminology

Multi-Media

One approach to the problem of defining the multi-image presentation should be the clarification of terminology. We read these days in the literature about multi-media, multi-image, and other related terms. We hear of programs being produced in various formats utilizing still and motion picture projection on one or more screens, and we utilize an endless array of hardware and software in a great many different formats. To some extent, this multiplicity is the essence of the nature of the field. These kinds of presentations will probably continue to be presented in ways most familiar or appealing to each producer and this does not necessarily set a bad precedent. Yet, from all this seeming chaos, some order is emerging.

The term multi-media seems most often to mean the coordinated use of more than one medium for the presentation of information. Most popular are the single screen slide and tape presentations with filmstrip-tape presentations following close behind.



Picture I-1

A typical multi-media packaged presentation featuring a carousel drum of 35mm slides and a pre-recorded casette tape.

Photo courtesy: Duane Troxel

The notion of multi-media comes from the combining of the visual medium of the projected slides with the audible medium of recorded sound, operating in unison in a pre-packaged presentation.

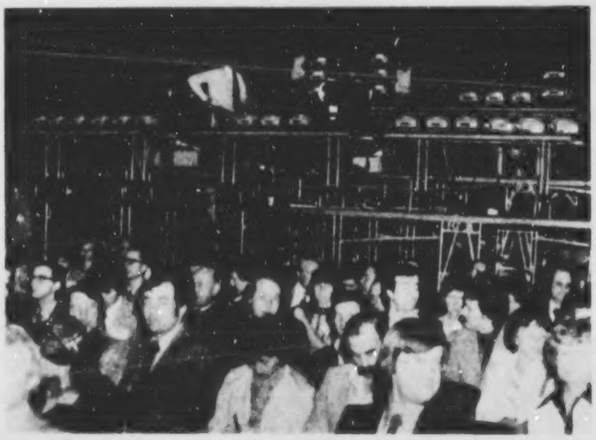
The possibilities for the presentation of ideas and concepts seem endless. Simple presentations can be done by manually advancing the slide projector along with a tape recorded message. (This is the usual approach with most filmstrip presentations.) Automation of this multi-media presentation can be easily introduced by utilizing special sound equipment which generates an electronic signal which is recorded along with the soundtrack on the tape. This signal is then used to control the projector. In other words, the producer need no longer attend the machine and advance (cycle) the slides manually. A further innovation has been the addition of the dissolve mode to the presentation. In this case, two slide projectors are focused on the same screen and are attached to a dissolve control and an audio playback machine. The slides are so sequenced in the two projectors that they alternately dissolve from one to the other without interjecting the abrupt dark period during the change (cycle) necessary when using only one projector. It becomes a matter of aesthetics and finances how one producer or another chooses. More important is the concern: what multi-media presentation method fits my ultimate objective? The beneficial possibilities for these kinds of presentations in education, in business and industry, and in entertainment have been aptly demonstrated. Today the pre-packaged multi-media presentation featuring slides or filmstrips along with casette tape recordings are widely utilized by teachers and students in schools. These kinds of presentations are often identified with individualized instruction. Many colleges and universities have individualized partial or complete courses utilizing slide-tape presentations used in individual study carrels located in learning centers and elsewhere. One of the best-known of these programs is the program of individualized mini courses in biology developed at Purdue University by Postlethwait. There are many other examples.

Textbook publishers have become highly interested in the packaged filmstrip-tape casette kit which often accompanies print materials which may include textbooks, workbooks, and manuals. The kits are usually packaged in attractive boxes which are then temptingly displayed on the shelves of libraries and instructional materials centers. Students can check out such multi-media kits for either individual use or small or even large class groups.

Business and industry have also made use of multi-media materials in both slide and filmstrip-tape formats. They have served aptly in various kinds of training situations for both new and in-service employees. In addition, multi-media programs have served well in the introduction of new products, orientation of potential customers toward various product lines, and a myriad of other uses.

Multi-Image

It might be stated that multi-image begins where the average multi-media presentation ends. The defining of multi-image as a three screen slide show with a synchronized sound track in comparison to the standard one screen multi-media program falls somewhat short of the true definition. To define multi-image in its true definition requires a much broader description. It is like a motion picture in that it may use cuts, dissolves, fades and special effects. It is unlike the motion picture in that its special effects are created during the presentation through the use of programmed electronic equipment rather than done beforehand in the laboratory. It is like a slide show in that it generally uses projected 2x2 slides. It is unlike the simple slide show in that it generally uses multiple slide projectors with multiple simultaneous images on the screen. The multi-image presentation is unique in that it almost demands that the viewer participate by actively following the communicative content of the message. The viewer is presented a series of changing images. The images may be a part of a larger whole or they may be individual images that make different statements about the primary topic. Thus, the viewer must select the primary image from among many by exercising his or her personal preference or by accepting direction cues given by the producer. This requires the viewer to carefully scrutinize the information that is presented and to select the primary image through personal decision making.



Picture I-2
A multi-image projection set up.

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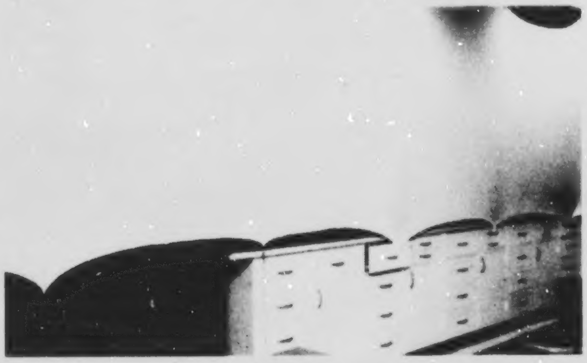


Picture I-3
A multi-image screen.
Photo courtesy: Duane Troxel

Consideration of multi-image, in terms of its position with respect to other art forms also concerned with visual imagery and audio reproduction, brings us to the realization that it is a very broad form of art. Multi-image presentations are capable of mixing all of these art forms into a unified whole. It offers a level of viewer participation that approaches that which is obtained with the theatre. Just as the viewer must visually follow the actor-performer as he or she moves and dances on the stage, the multi-image audience must follow the images as they move and "dance" on the screen.

In a final definition, it can be said that the multi-image presentation is largely coming into its own as a product of the revolution in solid state electronics. Through the use of micro-processers and other electronic controls, recorded sound, still and motion picture images, and projection equipment, the multi-image presentation is restricted only by the bounds set by the imagination of the producer. It is a presentation that generally uses the "ideal" number of three projected images (but is not necessarily limited to three), an electronic programmer, and sound reproducing equipment. The equipment, when made to work with the vivid imagination of a creative producer, provides us with the multi-image presentation.

The Aesthetics of Multi-Image

The multi-image presentation, perhaps more than any other means of communication offers opportunities for artistic expression. The broad sweep of the images moving and tempting the viewer in various ways along with the almost unlimited combinations of sound can convey ideas and concepts very effectively. The viewer can thus be influenced by an endless series of progressions. Research into the effects of these techniques is only beginning. The high regard in which multi-image presentations are held is demonstrated constantly by the large number of presentations that business and industry have commissioned for both orientation and promotional purposes. Many of the chambers of commerce of large U. S. cities use multi-image presentations for their visitor introduction programs. During the 1976 bi-centennial year, exhibit centers throughout the country featured multi-image presentations. As producers become more informed about the impact and aesthetic value of the multi-image presentation, and as equipment becomes even more sophisticated, endless possibilities appear for this art form.

It is often said that making multi-image presentations requires much time and effort. Critics further point out that multi-image presentations are a costly way of saying on a number of screens what can be communicated equally well on one screen. The logic and logistics of multi-image presentations for school and college use have been questioned. Many of these concerns seem justified in light of cost and manpower commitment. The important factor lies with the attitude and dedication of the producer. What does he wish to say and how does he wish to say it? There is justification for the use of multi-image when the objectives seem to call for this kind of presentation. Much of this book will explain how and why multi-image presentations can best be utilized.

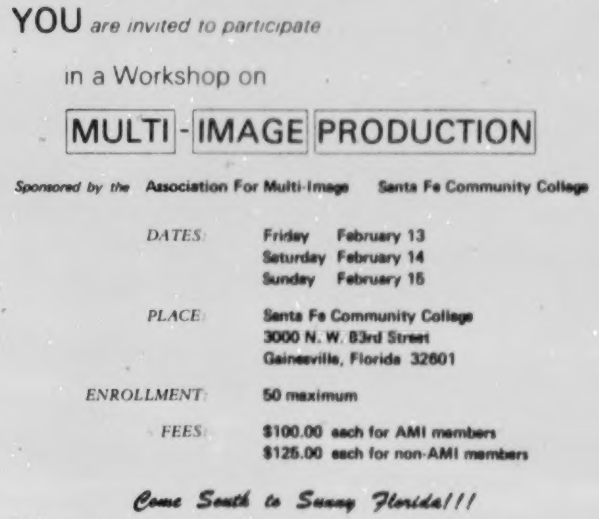
In various areas of education, the multi-image presentation offers a unique method for communicating information. In a day when the economics of individualized instruction are often being questioned, multi-image provides a further flexible alternative along with other traditional means of large group instruction. Whether and how this medium can contribute to the solution of specific classroom teaching/learning problems needs further research.

The State of the Art

The growth of the multi-image concept has been phenomenal within the past decade. Growing numbers of producers in almost every walk of life are becoming aware of its potential. Multi-image festivals and workshops are becoming numerous. Architects and facilities planners are including large-group, multi-image projection areas in their blueprints for schools and colleges. The terminology of the field has become more universally understood. There seems to be a growing acceptance of multi-image as an entirely new art form. Both the business and educational communities are becoming aware that multi-image may indeed have advantages for communication beyond that available through the more traditional media of film and television.

This communication potential seems to manifest itself best when there is simultaneous projection on three screens. Interest is not only sustained better but can be held and influenced in novel ways. While television and film could be thought of as being the more static media, limited to a single viewing area, the concept of multi-image affords the viewer a number of viewing areas. The further mixture of sound adds an additional dimension.

Manufacturers of hardware for multi-image generally keep pace with or even lead the growing field. There are almost 30 manufacturers of electronic programming devices alone, and an equal number of manufacturers of dissolve controls and other related equipment. Manufacturers of audio recording and playback equipment are equally numerous due to their alternative markets. A source of growth potential as well as a problem within the field has been the almost constantly evolving electronic knowhow. Just when producers have learned to fully exploit the features of one kind of programmer and its related equipment, a new and more sophisticated one often comes along. A similar growth is seen for audio recording and playback equipment. Working to keep pace with the manufacturers of multi-image equipment are the practitioners of the art form. Over 20 colleges and universities offer courses in multi-image in one form or another. There are numerous additional community colleges, vocational-technical schools, and other schools where courses in multi-image are taught. The list grows every year.



YOU are invited to participate

in a Workshop on

MULTI - IMAGE PRODUCTION

Sponsored by the Association For Multi-Image Santa Fe Community College

DATES	Friday February 13 Saturday February 14 Sunday February 15
PLACE	Santa Fe Community College 3000 N. W. 83rd Street Gainesville, Florida 32601
ENROLLMENT	50 maximum
FEES	$100.00 each for AMI members $125.00 each for non-AMI members

Come South to Sunny Florida!!!

Picture I-4

A college workshop brochure on multi-image.

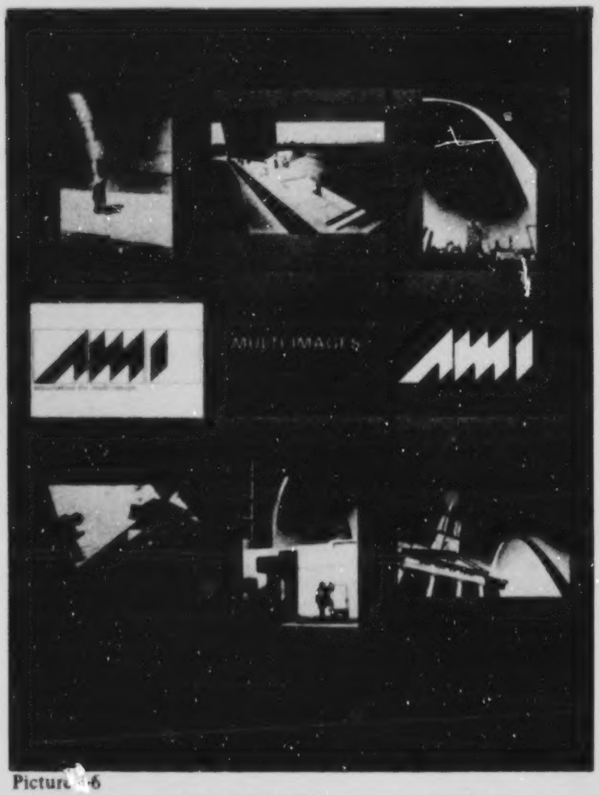
AMI Collection

The Association for Educational Communications and Technology, a professional group of educators from schools, colleges, and other professional segments, has grown increasingly aware of the concept of multi-image. In addition to a number of articles in its magazine, *Audiovisual Instruction*, within the past few years, significant research abstracts on multi-image have been featured in its scholarly journal *Audiovisual Communication Review*. In addition, a number of general sessions at the annual AECT Convention have been done in multi-image as well as numerous smaller sessions. A multi-image festival is now featured every year. The Association for Multi-Image, which is affiliated with the Association for Educational Communications and Technology, began in 1974. Today it enlists over 500 members located throughout this country and the world. AMI's activities are many-faceted, including not only the publishing of this book, but workshops, symposiums, a regular seasonal magazine, a newsletter, and its own national conference and exposition.

Picture I-5

Brochures for multi-image workshops which were presented at large conventions.

AMI Collection



Picture [illegible]-6

Front page of MULTI-IMAGES, magazine for the Association for Multi-Image.

AMI Collection

The National Audiovisual Association (NAVA), an organization of manufacturers and business-people, has also recognized the potential of this artform. Along with the Association for Multi-Image, they have for the past few years sponsored *a two-day symposium on multi-image for both* producers and other interested persons. In addition to the previously mentioned professional associations, there are numerous other business and industrial groups who have an interest in multi-image. There is little doubt that the decade of the 80's will see further movement in this direction.

Some of the major problems facing the field today include:

1. The need for further acceptance of multi-image on the part of teachers, administrators, other educators, and the business community.
2. Standardization of some of the common functional characteristics of the hardware used for multi-image presentations.
3. A central depository for ready-prepared multi-image programs and the development of methods for the cataloging, storage, and distribution of multi-image programs across this country and the world.
4. There is an obvious need for further research and experimentation into how multi-image presentations can teach, motivate, and communicate most effectively.

With leadership from the Association for Multi-Image and with greater awareness and interest on the part of other professional organizations, the future of multi-image looks bright. Like other means of communication, it remains for individual producers and researchers to bring out the unseen potential of multi-image as well as to extend what we already know to be its strongest set of capabilities.

CHAPTER II

HISTORY, THEORY, AND RESEARCH RELATED TO MULTI-IMAGE

Ken Burke and Bernard Fradkin

Self-contained multi-image presentations apparently began with a spectacular lecture on "Communication" done at the University of Georgia in early 1953 by Charles Eames, George Nelson, and Alexander Girard. Related avante-garde mixtures known as Intermedia began in the summer of 1952 with an untitled lecture/performance by John Cage at Black Mountain College in North Carolina. Both of these forms of communication are dependent upon modern electronic technology to provide such elements as projected multiple images. Older forms of communication also employed multi-imagery and complex mixtures of components.

Mixed media combinations of performers, music, song, dance, costume, and scenery have been used for centuries in the performing arts. Experimental theatre works and sculptural environments, as developed in the 20th century through Intermedia, have had an even more direct influence on producers of multi-image programs. Further elaboration on the history of Intermedia may be found in Burke (1972), Kirby (1965, 1969), Kostelanetz (1968), Renan (1967), and Youngblood (1970). In addition to this theatrical influence on modern multi-imagery, there is a long history of multiple imagery in the visual arts.

Visual Arts

As noted in Janson (1962) the use of multiple image has been found in Ancient, Classical, Medieval, and Renaissance civilizations. Multiple layers of figures involved in related activities are part of the earliest cave paintings, such as those at Altamira in Spain and Lascaux in France. These record the last stages of the Paleolithic Period, 20,000 years ago. Images of animals are often superimposed with the further addition of spears and arrows, hinting at stories of hunting. In the Lascaux cave, bison, deer and horses are massed on the wall and ceiling, producing a multi-visual effect encompassing the viewer. Later, multiple registers of figures and symbols were common in the tomb and temple decorations of the ancient Mesopotamian, Egyptian, Indian, and Oriental cultures.

Multiple images are also distinct components of the record left from Classical times. There are hundreds of surviving ornamental panels, paintings, and building and vase decorations that document the Greek and Roman acceptance of simultaneous viewpoints and activities. One outstanding example is the column of Trajan, erected in 106-113 AD, to celebrate Trajan's victory in the Dacian Wars. A continuous band of relief sculpture winds up and around the column, thus forcing the viewer to circle it again and again to capture the progression of events. The viewer also has the opportunity to compare and contrast past and future events at a glance since there are 150 scenes depicted. Similarly, the Byzantine and early Christian periods contributed imposing examples of multiple image, shifting spacial and temporal viewpoints, and interrelated history and theology. Domed mosaics, mosaic floors, murals, and sarcophagi provided numerous opportunities to visualize themes in religious art.

The Medieval civilizations further refined and elaborated on multiple image, adding even greater scale and complexity to the visual message. The revival of stone sculpture during the Romanesque Period (ca. 1000-1200) produced dramatic illustrations of complex religious motifs, as evidenced by works such as the Mission of the Apostles (Ste.-Madeleine, Vezelay, France, 1120-32) and the Last Judgment (Autun Cathedral, France, 1130-35). The evolution of art and design in the Gothic period resulted in multi-image stained glass window paintings. These masterpieces complemented Gothic architecture and projected multi-colored images onto the floors of the great cathedrals. Altar-piece paintings, such as Matthias Grunewald's three-level triptych of the Crucifixion and Life of Christ (1515), were additional multiple image presentations to the Gothic society. The total experience of the Gothic cathedral, as described by Hugo (1831), can be seen as contributing to the history of multiple imagery with its combination of:

> the three receding pointing doorways, the decorated and indented band of the twenty-eight royal niches, the vast central circular window, flanked by the two lateral ones . . . harmonious parts of one magnificent whole . . . unfold themselves to the eye, in combination unconfused, with the innumerable details of statuary, sculpture, and carving in powerful alliance with the tranquil grandeur of the whole.

Although the art of the Renaissance turned Western visual attention to single image and the depiction of linear perspective, there were still some notable multiple images depicting simultaneous viewpoints and activities. Among the most dramatic examples of Renaissance multi-image is the Sistine Chapel ceiling mural, painted by Michelangelo. In this masterwork, events from the Book of Genesis are interwoven with figures from biblical and mythological literature. Some of the more elaborate churches and palace halls of the Baroque and Rococo periods also retained lavish multi-image decorations, uniting painting, sculpture and architecture into dazzling illusions of perspective.

Until our modern period, easel painting and pedestal sculpture became more focused on photographic depictions of single images. However, multiple image in the form of multiple perspective was reemphasized in the early 20th century by Picasso and Braque. Media analyst Marshall McLuhan (1964) describes the visual transformation this way:

Picture II-1

Michelangelo. GOD Separating Day From Night, Sistine Chapel, Vatican, Rome.

Photo courtesy: The Vatican, Rome.

> . . . cubism, by giving the inside and outside, the top, bottom, back, and front and the rest, in two dimensions, drops the illusion of perspective in favor of instant sensory awareness of the whole.

Picture II-2
Picasso. Guernica.
Photo courtesy: Metropolitan Museum of Art, New York.

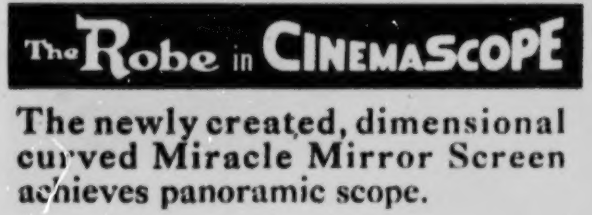
Following Cubism, multi-image in the visual arts developed in several directions, especially: (1) the large-format, total-field compositions of painters Jackson Pollack, Franz Kline, Ellsworth Kelly, Kenneth Noland, and Frank Stella; (2) the large-scale multiple image of "pop artists" Andy Warhol and James Rosenquist; and (3) the multiple meanings of Robert Rauschenberg's painting/sculpture combinations. Illustrations of the works of all these artists may be found in sources such as Arnason (1968). Multiple images can also be found in the modern popular arts, as in the photojournalistic essays in *Life* and similar magazines. Layout rules were developed for one- and two-page arrangements of photographs as this style of storytelling became a mainstay of reporting. Current layout standards in news magazines and advertising pages reveal a continued concern for interactions of line, shape, size, and color between separate pictorial elements.

Multi-Image Cinema

The cinema was also a direct predecessor of modern electronic multi-image programs. The difference between these early multi-screen films and current multi-image programs is more in purpose than in technology. Multi-image films, except for a few avante-garde experiments, were simple attempts to extend the environment shown in single screen films. As detailed in Burke (1972), the first public multi-screen film was the Cineorama display of the 1900 Paris Exhibition. Compared to modern World's Fair presentation techniques, this production was still quite impressive. Images filmed during a balloon excursion over Europe were projected on a circular system of screens 30 feet high and 330 feet around. Viewers in a mock balloon in the center were given the feeling of actually flying across Europe. This 360° presentation technique has been a popular inclusion at every international exposition since the Brussels Fair in 1958. Some educational institutions have incorporated this technique into a permanent facility, such as the 12-screen, 26-projector "Egg" which opened in 1975 at the University of Texas at Austin. This elaborate system is normally used for special presentations rather than regular classroom instruction; however, one study (Carmichael, 1974) has investigated successful affective learning in such a total media environment.

In 1926 in Paris Abel Gance released the first commercial multi-screen film, *Napoleon*. Gance used the traditional form of the triptych to contain his dynamic cinema experiment. Single images were expanded to wide screen panoramas, as in Cineorama, but separate multi-images were used as well to show juxtapositions and various points in time. Gance's technique was ahead of his technology and his audience; however, in 1952, both problems were conquered by Fred Waller's three-screen spectacular, Cinerama. After successful panoramas were achieved in *This Is Cinerama*, multiple projection was soon replaced by anamorphic lenses and wider frames of film. Thus, the development of multi-screen cinema might have been completely reabsorbed into single image, had it not been for creators such as Charles Eames and Josef Svoboda.

Picture II-3
This Is Cinerama with Gathering of the Clans in Scotland.
Photo courtesy: Golden Press, New York, N.Y.



The Robe in CINEMASCOPE

The newly created, dimensional curved Miracle Mirror Screen achieves panoramic scope.

Picture II-4
Advertisement for The Robe in Cinemascope from 20th Century.
From the book, The American Movies Reference Book by Paul Michael, 1969. Published by Prentice-Hall, Inc., Englewood Cliffs, NJ

Modern Multi-Image Programs

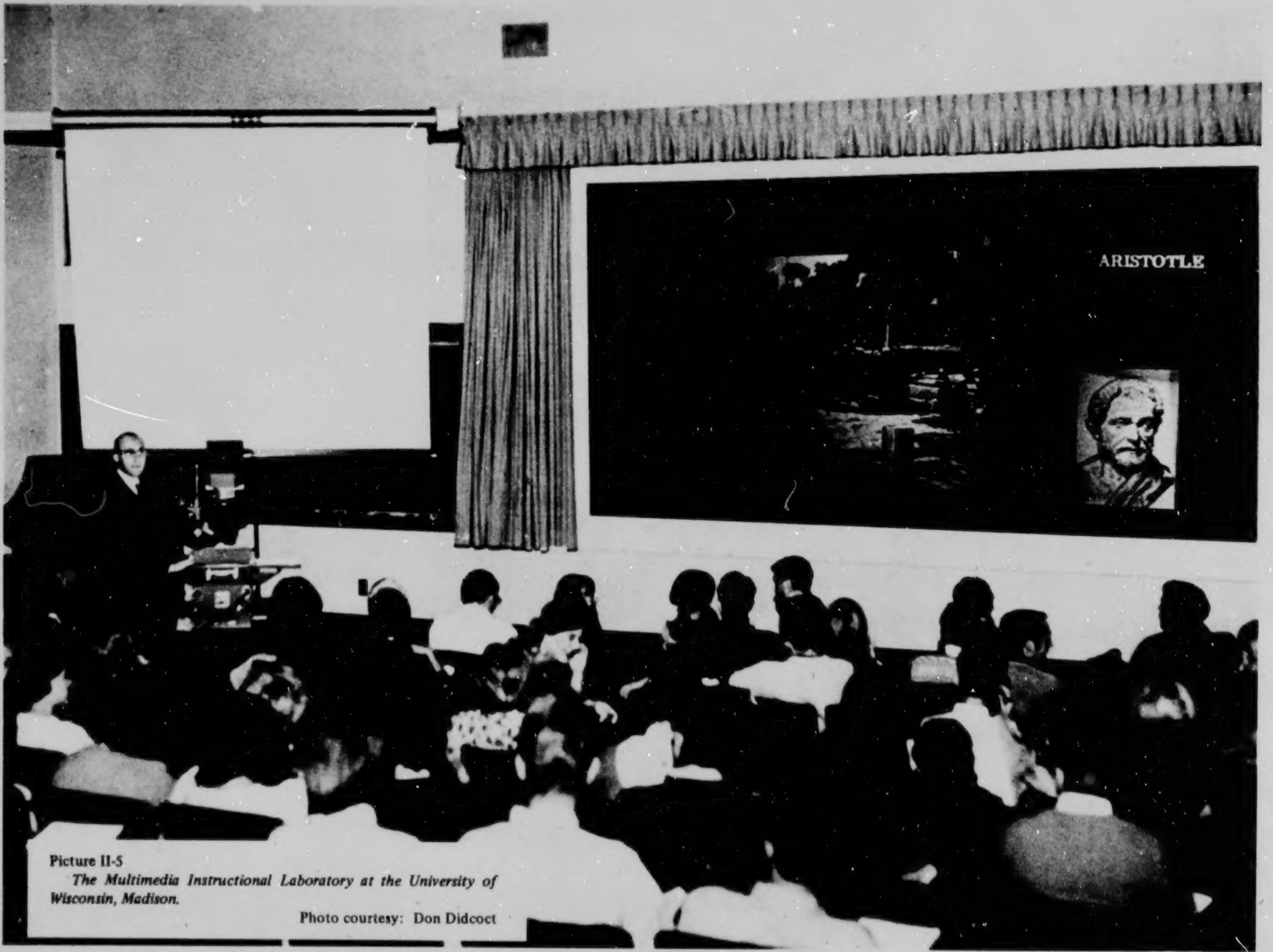
As mentioned before, Eames seems to be the first to transfer the multi-image technique to education from its specialized uses in artistic embellishment, cinematic experimentation, and aviation training (see Waller, 1953). The 1953 Eames-Nelson lecture, developed for undergraduate art students, used the media of film, slides, and audio tape – plus canned aromas – to interpret the content material to the viewers. The use of a live lecturer was eliminated illustrating the fullest potential of the media to communicate the message. The program included a 10-minute film on the Shannon-Weaver communication model, 8 minutes of triptych slide/tape montages illustrating the concept of abstraction, and a 10-minute film on ancient Egypt as a dead civilization which transmits live messages.

Eames was also responsible for two impressive multi-image presentations at World's Fairs. His 6-screen "House of Science" in Seattle in 1962 and 21-screen "Think" for IBM at the 1964 New York Fair were both highly acclaimed. Public attention drawn to these Fair extravaganzas, plus the documented success of instructional multi-image programs in the early 1960s, provided the basis for further acceptance and use of multi-image.

Certainly public attention to World's Fair multi-imagery was increased by the spectaculars of Josef Svoboda. Perhaps Svoboda is best remembered for perfecting Erwin Piscator's media-oriented Epic Theatre into the wonders of Laterna Magika (Burian, 1971), but he was also responsible for sophisticated multi-image programs as well. His Polyekran, presented at the 1958 Brussels Fair, was an 8-screen slide/tape/film montage about the Prague Music Festival. As with the Eames-Nelson lecture, no narrator interrupted the flow of the media presentation. Among the more popular effects in this presentation was the "jumping" of a ballerina from screen to screen and the "freezing" of her motion as the presentation shifted from film to slides. Svoboda provided another World's Fair triumph in Montreal in 1967 with his Diapolyekran display. This mammoth 15-minute multi-screen slide/tape show took 5 million electronic commands to complete, and in some way was reminiscent of the prehistoric cave paintings. Images changed continuously on the 110 screens, building up spatial and temporal ambiguities unknown in the more utilitarian uses of multi-imagery.

Following the Eames-Nelson lecture of 1953 and the Svoboda performances of 1958, the Tele-Prompter Corporation produced multi-image systems and programs for various business, industry, and government groups, especially for military briefing rooms. These displays were known as Telemation and consisted of 3- or 5-screen, rear projection, automated slide/tape/film systems. One of the early Telemation programs was the 5-screen show made for the U. S. Departments of State, Agriculture, and Commerce, presented at the World Agricultural Fair in New Delhi, December 1959-February 1960. After visiting the installation, Dr. John Guy Fawlkes commissioned a Telemation instructional system for the University of Wisconsin's School of Education. This Multimedia Instructional Laboratory, first directed by Dr. Richard Hubbard, provided a 100-seat multi-image auditorium and required a support staff of designers, artists, photographers, engineers and programmers. A permanent staff proved to be the key factor in the success of the facility, since the average multi-image lecture took 120 man hours of preparation, not including the work of the instructor in researching and organizing the lecture. Pre-planning was essential as 6 to 8 weeks were necessary to organize a 50-minute presentation. Dr. Gerald F. McVey (1966), director of the Multi-image Instructional Laboratory (M.I.L.) 1965-1973, estimated the cost of an average lecture to be about $300 excluding the time of the staff in preparing the materials. Certainly there have been quality lectures which cost less, but the Wisconsin series are particularly sophisticated.

The M.I.L. featured a triptych (one large square screen on the left and two stacked horizontals on the right) which permitted display of 35mm slides, film, 3¼"x4" lantern slides, opaque projection, and video. Another screen in the classroom allowed overhead projection as well. Audio equipment consisted of microphone, phonograph, and stereo tape. Although the system was fully automated, there was override control by the instructor through a remote connection from the lectern. This permitted much greater flexibility for instructional use since interaction between teacher and students could then be incorporated into the flow of the lecture. All programmed activities were controlled by punched paper cards fed into a reader; cards were advanced by a cue button in the semi-automatic mode and by taped electronic signals in the automatic mode. Manual operation was accomplished through a series of controls both at the lectern and backstage. All modern programmed systems are some variation on these two original Telemation methods – those being either audio tones or punched paper tape. Both systems enable one to handle a great deal of complexity, but are subject to occasional playback difficulties. A recent promising technological breakthrough is the introduction of digital program storage, recall, and command through the use of



Picture II-5

The Multimedia Instructional Laboratory at the University of Wisconsin, Madison.

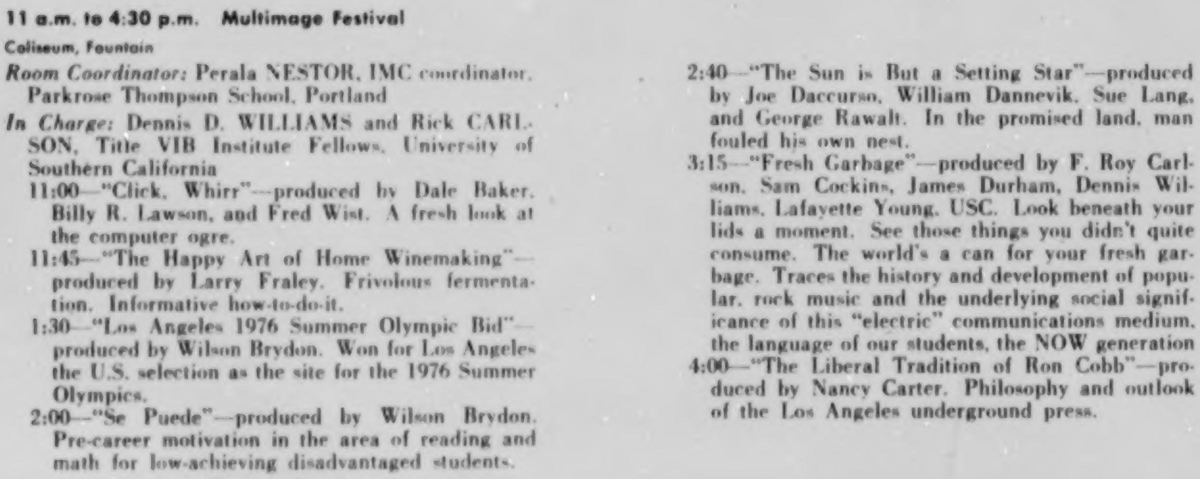
Photo courtesy: Don Didcoct

microprocessors (i.e. "mini-computers"). Possibly this approach will become the standard programming system of the future.

The first lecture presented at the M.I.L. was on January 30, 1961, by Dr. Michael B. Petrovich for a course in Russian History. Supportive response from students and other faculty led to regular use of the installation for courses in Art Survey, Human Abilities and Learning, History of the Theatre, History of Motion Pictures, and others. Success of the M.I.L. and similar facilities at other campuses, coupled with public awareness resulting from publicity in educational journals, led to a great increase of multi-image facilities in education, business, government, and industry. Another factor that helped spread multi-image was the natural dispersion of students and faculty from multi-image centers, such as the University of Wisconsin. Another major center for multi-image was the University of Southern California, where Dr. James Finn initiated a graduate multi-image production course in 1963. This followed a very successful 3-screen presentation at the Division of Audio Visual Instruction (DAVI, now AECT) convention by Finn and Dr. Robert Hall in Kansas City, March 1962.

Multi-image became popular throughout the 1960s in public displays, theatrical entertainment, art galleries, and avante-garde performances. The most lavish displays were at the 1964 New York Fair, Expo '67 at Montreal, and Expo '70 at Osaka. Josef Svoboda developed the most successful uses of multi-image in the legitimate theatre; an excellent example was *Intoleranza* done in Boston in 1965, utilizing live, remote broadcast, and time-delayed video. Stan Vanderbeek and the USCO group were the primary exponents of experimental multi-image. At the New Cinema I Festival in New York City in late 1965, for example, Vanderbeek presented "Move Movies." Information on these events and many others is available in the sources cited at the beginning of this chapter.

Indicative of the continually growing use of multi-image communication techniques is the Multi-Image Festival held each year as a feature of the AECT convention. This annual festival quickly became the primary outlet for the demonstration of "state of the art" multi-image programs. Growth and success of both the multi-image technique and the national festival led to the formation of the Association for Multi-Image in 1974. As the history of the field continues to be written, the configuration and ease of technical operations continues to be refined. Through the medium of both publications and dialogue, producers have come to accept more conventional definitions and formats, become skilled with the use of less expensive equipment, and are showing greater flexibility in their productions and presentations. An increasing awareness of multi-image history has shifted attention from "what to do" to "how best to do it."



11 a.m. to 4:30 p.m. Multimage Festival

Coliseum, Fountain

Room Coordinator: Perala NESTOR, IMC coordinator, Parkrose Thompson School, Portland

In Charge: Dennis D. WILLIAMS and Rick CARLSON, Title VIB Institute Fellows, University of Southern California

11:00—"Click, Whirr"—produced by Dale Baker, Billy R. Lawson, and Fred Wist. A fresh look at the computer ogre.

11:45—"The Happy Art of Home Winemaking"—produced by Larry Fraley. Frivolous fermentation. Informative how-to-do-it.

1:30—"Los Angeles 1976 Summer Olympic Bid"—produced by Wilson Brydon. Won for Los Angeles the U.S. selection as the site for the 1976 Summer Olympics.

2:00—"Se Puede"—produced by Wilson Brydon. Pre-career motivation in the area of reading and math for low-achieving disadvantaged students.

2:40—"The Sun is But a Setting Star"—produced by Joe Daccurso, William Dannevik, Sue Lang, and George Rawalt. In the promised land, man fouled his own nest.

3:15—"Fresh Garbage"—produced by F. Roy Carlson, Sam Cockins, James Durham, Dennis Williams, Lafayette Young, USC. Look beneath your lids a moment. See those things you didn't quite consume. The world's a can for your fresh garbage. Traces the history and development of popular, rock music and the underlying social significance of this "electric" communications medium, the language of our students, the NOW generation

4:00—"The Liberal Tradition of Ron Cobb"—produced by Nancy Carter. Philosophy and outlook of the Los Angeles underground press.

Picture II-6

Part of the program for the first multi-image festival presented at the DAVI (AECT) Convention, Portland, Oregon, 1969.

Courtesy: AECT, Washington, D.C.

Research and Theory

Producers of multi-image programs are constantly faced with innumerable decisions in designing presentations for their audiences. When does the medium begin to compete with the message? What is the effect of compressing visual information? How much redundancy is necessary? How much cross-cueing of related information is necessary? How important is the audio channel? How does the human perceptual system operate in accepting large quantities of information? Questions like these and others need answers if we are to use the characteristics and flexibilities of multiple image presentations to their best advantage.

Occasional failure in the proper use of multi-image has resulted in some scathing negative criticism such as:

> Multi-media has become a buzz-phrase; a term often given to a bunch of unrelated slides on three screens with noisy music and some philosophical statements from the people who put it together.
>
> (Buckland, 1971)

> In sharp contrast to orchestration, the multi-media faddists throw raw unordered data out at students. This unhappy consequence of instant culture, this pursuit of simultaneous chaos is only an extreme for reductionism.
>
> (John Silber in *Fresques*, 1971)

It appears that many of the critics of multi-image have but a limited understanding of the available supporting research that is woven into good multi-image programs. Findings supporting the effectiveness of the multi-image technique are drawn from research in several disciplines, notably psychology, education, and communications. Until the field of multi-image develops its own body of supportive evidence, it is important to apply whatever theories and results seem appropriate from a variety of existing models.

Early Research

Most studies on the effectiveness of multi-image programs have been done on instructional programs. Dr. Donald Perrin (1969), in his theory of multi-image presentations, says that simultaneous images on a large screen – or adjacent screens – create a pattern of information comparison and simultaneous visual montage. These visually-rich displays increase information density and facilitate certain types of learning. When Perrin made this hypothesis, he based it on the available knowledge from existing research. At that time there were five studies that dealt directly with multi-image; in addition, there was a related body of literature concerning the effectiveness of audiovisual redundancy.

Conclusive statements about the effective use of multi-image can only be based on a large body of consistent research. The scarcity of studies on the characteristics of multi-image programs prevents any such definite conclusions. Nevertheless, trends can be seen to emerge from the existing research. Studies conducted during the 1950s and 1960s indicate that levels of cognitive recall are higher after multi-image presentations than after single-image presentations of the same material. These results, taken from the work of Roshka (1958), Malandin (undated), and Allen and Cooney (1964), are valid, however, only with children of 6th grade level and below. Information retention and image recall procedures apparently develop in human minds by about age 12. These mental operations seem to cancel previous gains brought about by the use of multiple image. Another study from this period, done by Lombard (1969), confirmed that with older learners only low-achieving females showed better recall with multiple images when compared to a single image presentation of similar material.

Related to the above research is the indication from Hartman (1961) and Hsia (1968) that audio presentations work best with simple educational material, especially when the learners are young children or illiterates. Print versions of the same material or more complex material bring better results from older children and literate adults. Thus, there seems to be clear support for using audio tapes, multi-image program, or other media that provide the temporal organization for the learner when the learners are either young or "slow." Arguments for using such media with older, normal learners were more difficult to support.

Research from the 1960s on multiple channel information processing implies support for multi-image programs. Admittedly, the results of this particular research are not directly applicable to multi-image since "multiple channel" in these studies refers only to the stimulation of two senses with a single medium such as a sound film. Nevertheless, there is support for directing message elements simultaneously to the learner's eyes and ears. Audio and print redundancy (when projected to the slides) often yielded more cognitive recall than either audio or print used alone. Further, the research of Hartman (1961) and Severin (1967) showed the audio/pictorial combinations to be the most effective instructional use of media. Anderson's (1969) study indicates that learners have negative reactions to all audio, print and pictorial combinations *except* pictorial/spoken, which is perceived as clear, easy and complete.

From the above information, it is clear that Perrin had reason to be optimistic concerning the use of multiple image. He had no specific evidence, however, that multi-image is more effective for learners above the 6th grade level. Nevertheless, he and other educators of the 1960s such as Roberts and Crawford (1964) were confident that multi-image programs would be useful for attracting attention, showing comparisons and contrasts, adding supplementary material to a central concept, maintaining continuity through successive steps of a process, maintaining long interest spans and high motivation levels, and keeping the learners oriented on the subject. However, some research of the early 1970s – by Bollman (1970), Atherton (1971), and Didcoct (1972) – continued to show no significant difference between the effects of single image and multiple image programs. Didcoct's study confirmed our suspicions that a multi-image program with poor technical qualities would be detrimental to learning. The recall level with such a program was lower than with a good single image presentation. Another study, done by Fradkin (1971), shows better cognitive recall with a single image presentation. Fradkin's study is unique in that he compared four unrelated films presented in 1-, 2-, and 4-screen formats. The lack of relevant cues among the images resulted in information overload and lower levels of recall with the multi-screen formats.

Current Trends

Recent studies – Reid (1970), Ingli (1972), Brydon (1974), and Ausburn (1975) – show significant gains when comparing multi-image programs to single image programs. Whereas earlier researchers had found no cognitive differences in adults when comparing these presentation styles, Ingli showed superior results with a 3-screen program. Further, affective differences between the two methods had not previously been found, but Reid's 3-screen film was more affectively successful. Brydon's results were the most conclusive of all for multi-image. He found multi-image to be both cognitively superior (with industrial mechanical workers) and affectively superior (with high school students). Ausburn's study showed multiple imagery to be superior in aiding with visual location tasks; further, multi-image proved very successful in aiding students with a noted preference for the sense of touch (haptic learners) with their tasks. As with Lombard's study, multi-image is shown to be an instructional equalizer for certain types of learners, and even "normal" learners benefit from multi-image as shown by Reid, Ingli, and Brydon. No explanation is clearly evident here as to why these recent findings show success from multi-image used with older learners. However, there is a possibility that recent designers of multi-image programs have learned to accommodate the "certain types of learning situations" noted by Perrin.

The interaction pattern of seeing several images in the same visual field produces a unique visual language problem. Depending on the placement of the images, the viewer may gain additional insights, become totally confused, or simply become bored by an overdose of visual redundancy. In theory and practice, the designer of a multi-image program should be operating within the *cue summation* theory. As explained by Hartman and Severin (1967), more learning occurs when relevant cues (bits of information) are combined across the channels of transmission. For example, more information can be added to the audio by using related, not redundant, pictures. This should increase the understanding of the message and provide a more pleasing informational package than is offered by redundancy. Of course, some redundancy may be necessary when the information is new or complex. In such cases, the added reinforcement will aid retention of the unfamiliar material.

Two recent studies have specifically investigated the use of multiple image cue summation to its greatest advantage. This represents an important evolution in multi-image research since several of the older studies simply compared single and multiple versions of the *same* images. It would seem that the most progressive use of multi-image would be to use the expanded format for *additions* to a single-image concept. Details, comparisons, contrasts, reference points, recurring themes, ironic comments and the like should be used to enhance the multi-image format through cue summation. Presumably, this would result in better response and learning than would a multi-image format that just followed a linear progression. Tam and Reeve (1971) researched the effect of various methods of organizing and accumulating images in audiovisual presentations about geography. Recall scores from their 10th grade subjects were higher with multi-image programs and highest with formats that related images *conceptually* rather than *sequentially*. However, none of the results were statistically significant. Fradkin and Meyrowitz (1975) performed a similar study, again with no significant differences between single and multiple image programs; nevertheless, for cognitive recall their subjects recorded significantly more learning when the multi-image program was conceptually organized. This evidence suggests that the design of a multi-image program should follow the principle of cue summation in supporting the presentation's defined objectives.

All subject material may not lend itself to the types of visualization suggested in this chapter. Perhaps the use of simultaneous imagery should be reserved for those kinds of tasks requiring such complexity (conceptual relationships, motivating slow learners). The producer or designer of an instructional multi-image program should carefully consider the characteristics and advantages of multiple image techniques when organizing the presentation. In addition, the positioning of visuals and sequencing of images should be a basic consideration in program design. *Sequential* triptychs are 3-screen versions of 1-screen programs and cannot be expected to provide much improvement. The *conceptual* triptych, as tested by Didcoct, Tam, Reeve, Fradkin, and Meyrowitz, uses sequential material but relates it internally for greatest clarity and impact. Presumably, the most effective triptychs would be the *conceptual-expanded*, as tested by Reid, where additional, supportive material is added to the sequential framework. Lombard and Bollman did limited versions of this by repeating or retaining sequential slides at length, but this limited conceptual expansion is really no improvement over sequential or conceptual triptychs since the program material is not enlarged. Reid made the most positive use of conceptual-expanded imagery by enlarging his content from one to five screens without reducing the length of his program. He showed successfully that multi-image should be regarded as a unique medium with its own rules, conventions and devices. Using it properly may require different strategies and techniques than would a comparable film or videotape.

FIGURE II-1

A Comparison of Multi-Image Research
(All presentations were slide/tape with identical material unless otherwise noted.)

Study	Factor Measured	Subjects	Result
Malandin (no date)	simultaneous images in patterns of 2, 4 and 5; cog.	children	simultaneous images effective for 9-11 year olds
Roshka (1958)	sequential vs. simultaneous images; cognitive	children	simultaneous better for younger children
Allen and Cooney (1964)	1 screen vs. 3; linear vs. conceptual material; cog.	6th and 8th grade	for 6th, 3 better for mix of factual/conceptual; for 8th, both equal
Lombard (1969)	1 screen vs. 3; similar material; cognitive	10th grade	equal, 3 better for low-achieving females
Reid (1970)	1 vs. 5 screen film; similar material; affective	churchgoers	5 screen better in 2 of 3 parishes
Bollman (1970)	1 screen vs. 3; similar material; affective	undergrads	equal
Atherton (1971)	1 screen film vs. 3 screen slide/tape; cog. & aff.	undergrads	equal
Fradkin (1971)	1 vs. 2, 1 vs. 4; retention of unrelated visuals	10th grade	1 better than either 2 or 4
Tam and Reeve (1971)	1 vs. 2, 1 vs. 3, and sequential 3 vs. conceptual 3	undergrads	equal, higher trend for conceptual 3
Didcoct (1972)	1 vs. 3, 2 separate tests; cognitive and affective	undergrads	test 1, equal; test 2, 1 better for cog.
Ingli (1972)	1 screen vs. 3; cognitive; entire semester's course	undergrads	in 1 of 3 classes, 3 screen better
Yolles (1972)*	sequential 3 vs. conceptual 3; effects of narrator's age; cognitive	4th, 5th, 6th grade	sequential better for 4th and 6th; narrator, no difference
Brydon (1974)	1 vs. 3; cog. & aff.; 2 tests; 2nd, similar material	1-workers, 2-10th grade	3 screen better for everything tested
Meyrowitz and Fradkin (1975)	1 vs. 3; sequential 3 vs. conceptual 3	undergrads	1 and 3 equal, conceptual 3 better
Ausburn (1975)**	1 screen vs. 3; visual vs. haptic learners	undergrads	3 better, haptics do better with 3
Jodoin (1976)	1 vs. 3; cognitive and affective	undergrads	equal, except 3 better for delayed cog. retention

*This study confirms earlier ones that young children have better cognitive recall with a 3-screen program.

**This study confirms earlier ones that sequential triptychs are no improvement over single-image programs.

Information Processing

The literature supporting cue summation offers a strong argument for the necessity to plant relevant cues among simultaneous visuals. If multiple image is to survive and grow as a viable instructional technique, it must incorporate such research evidence. However, without a fundamental realization of basic information processing, further multi-image research and design would be invalid. Results from Hsia (1968) suggest that audiovisual presentations have distinct advantages over single channel presentations (that is, those addressing only one sense at a time, i.e. vision alone or hearing alone) provided that the learner is given an "optimal" level of information. Such a level refers to the maximum input capacity of the learner, assuming that no information overload occurs.

Travers (1967) refers to the problems of multiple sensory inputs and suggests that a multi-channel presentation is likely to be of value only when the rate of presentation is slow. Unfortunately, the compounding effects of multi-image presentations develop a continuous flow of information which quickly floods the human information processing system. Thus, designers of multi-image presentations should concentrate on the specific message and try to eliminate "noise" in the program. The producer may find that redundancy, simpler visuals, straight-forward audio or slower pacing are all needed to clarify certain program segments. In addition, the producer must decide if design and timing allow the learner to successfully alternate attention among the screens and soundtrack while still processing the flow of information.

As reported by Goldstein (1975), there are few studies that have explored the perception of multi-image programs. Meyers (1972), Nelson (1972), and others have measured eye movements in response to specific multi-image arrangements. Perrin considers the notions of selectivity and organization as "crucial" elements in the design of multi-image. A viewer given an obscure or complex stimulus with insufficient time for processing will have difficulty in locating and responding to the relevant information. Jones (1969) has shown that competing audio messages cannot be retained. McFee (1969) presents the same case for visuals:

> Visual ordering makes messages of content easier. Much of our responding is so fast that we are unaware of the processing we do. One of the tasks of the message designer is to make the visual sorting process easier; he selects and organizes visual information so that it is easier for the viewer to assimilate.

One of the prevalent theories of perception is the Broadbent model of information processing. This model assumes that one stimulus at a time gains access to the central nervous system, with additional stimuli kept in a temporary holding pattern. Such a system suggests that multiplicity and redundancy serve no function in successful media design. Fortunately for defenders of multi-image, Hsia (1971) has offered an alternative interpretation of the Broadbent model. He reminds us that what is important is the *total* information capacity of the central nervous system at any given second. Hsia says that if attention can be maintained and interference can be minimized we are capable of processing five to nine separate bits of information per second. Thus, multiple stimuli – such as volume, word content, shape, color and visual content – can be comprehended and retained. The important factor is the total complexity of any given portion of the program at any specific moment. Of course, further research is needed into the interaction of the audio and visual stimuli in terms of compounded complexity. Guidelines must be determined to help producers estimate what factors (line, size, color, direction, etc.) tend to merge into a single compound bit of information. Then, other guidelines must be sought about how such informational complexity increases as audio and visuals are brought together. The proper use of such guidelines would help multi-image designers avoid unwanted information overload.

We can see that multi-image has its advantages. The next step is to research more fully the proper design of such programs to insure maximum perceptual clarity, comprehension, and learning. Once better design principles have become known and accepted, research will be able to explore more fully what the potentials, advantages, and limitations are in this modern media mixture.

CHAPTER III

WHY WE USE MULTI-IMAGE PRESENTATIONS

Part I Palmer E. Dyer

Before we decide to produce any multi-image program, we must first satisfactorily answer the question of WHY we chose this format. Is it because we are searching for merely another way of presenting information? If our audience is young, is it because we realize that children today are more visually aware than any previous generation of learners? Or, is it because we feel that an impact derives from multi-image programming that cannot be obtained with any other form of message transmission? This question must be answered, especially since multi-image presentations require considerably more time, effort and expense than would normally be committed to a sequentially organized program.

The Basic Reasons

The valid reasons for choosing a multi-image format range from its impact in emotional appeal to its hoped-for effectiveness as an aid in instruction. Perhaps the foremost reason why many producers choose this format is its uniqueness. The impact of the multi-screen visuals literally galvanizes the viewer's attention. Thus, many programs are developed solely to take advantage of this uniqueness . . . this involvement of the audience. No behavioral objectives are identified, no follow-up evaluation is planned, and there are no results to be analyzed. The success of the program is measured in terms of supposed audience approval. Such a program may be developed to present a feeling, to visually stimulate the viewer, to arouse the audience through sight and sound.

Satisfying such a simple desire to stimulate the audience is, however, not the full scope of possibilities available through the format. Multi-image presentations can do more than just offer visual fireworks. These also must be considered by every producer before committing himself to this way of offering the message to the audience.

Thus it is helpful to identify a group of attributes in addition to the attention getting ability of multi-image or even the aesthetic preferences of the producer when selecting multi-image programming. Thus we find many pedagogically sound reasons for making use of this form of communication.

Ten Strengths of Multi-Image

Ten major strengths of multi-image have been identified. Obviously, these ten "strengths" can not be considered all-inclusive or even definitive; rather, they serve as a handy listing to stimulate additional dialogue and as a preliminary checklist for those considering the merits of this format. These ten strengths are:

(1) *Comparison:* The viewer attempts to identify the commonalities or similarities among several visuals. This is much easier when several visuals are presented simultaneously.

(2) *Contrast:* The viewer can more easily attempt to identify the differences when several visuals can be referred to simultaneously.

(3) *Multiple Perspective:* The same scene can be available from different points of view. Such changes of camera angle may dramatically alter the viewer's perception of a scene.

(4) *Sequence:* One can emphasize the flow or continuity of the visuals if they are progressively dissolved on and off the screens – especially if motion is simulated.

(5) *Juxtaposition:* By positioning images simultaneously next to one another multiple relationships among them can be made more obvious than would be possible if one needed to remember preceding visuals. This term implies the varying of size, shape, and screen position of any visual.

(6) *Direct Emphasis:* The viewers' attention can be focused upon specific visuals by organizing the composition of multiple visuals.

(7) *Sustain Emphasis:* A single, static reference visual may be presented and held on one screen while varying aspects of the same theme may be sequenced on the other viewing areas.

(8) *Motion Effect:* Motion may be simulated through the use of an animated series of rapidly changing still visuals.

(9) *Combining Motion and Still Pictures:* Motion pictures may be projected on one or more screens while still visuals of the same or different scenes can be presented on the other viewing areas. The two effects may be interspersed in unlimited combinations.

(10) *Panorama:* A wide angle composite view of a single scene may be presented across some or all the viewing areas. The extreme breadth of the panorama can make it very dramatic.

Although it may not matter to the producer who is interested in simply arousing an audience's attention, other producers should weigh their reasons before committing themselves to the multi-image approach. If it is the producer's intention to inform or to indoctrinate an audience, then it is important to know whether some of the listed "strengths" of multi-image presentations can be brought to bear in obtaining a better solution to the problem. If they pertain, then the deliberate design and planning of the program should systematically incorporate these approaches. If such effects do not seem to be required, a less involved and less expensive alternative may well suit the producer's needs.

SOME SPECIFIC CONSIDERATIONS

Part II

Ron Slawson

As an example of how multi-image programs are justified in educational settings – specifically in the two year public community college – let us examine the experience of Santa Fe Community College in Florida.

At Santa Fe Community College, the original idea was that if multi-image presentations could present information in an exciting and informative way to an audience in a shorter amount of time (as has been demonstrated by large corporations at various trade fairs) then one should try to adopt this technique in education.

In order to sell the idea of teaching using multi-image presentations to students and faculty, the first step was to offer a presentation. It was the late 1960's and a multi-image presentation titled "Times are Changing" (which was being prepared to keynote the American Association for Community, Junior Colleges Fiftieth Convention in Hawaii) was shown to the administration and faculty of Santa Fe College.

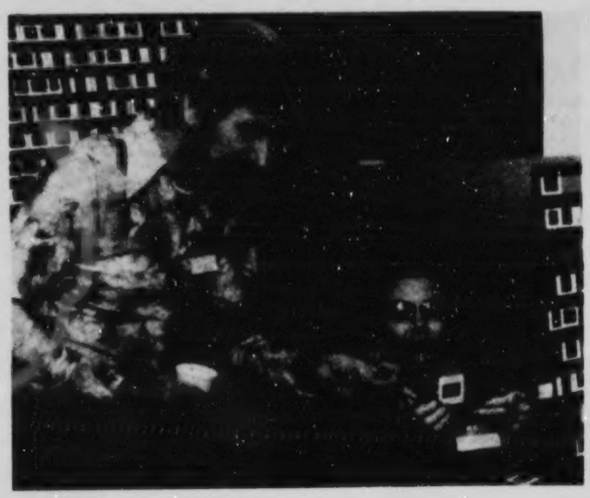
Since this presentation was judged as highly successful, the next step was to plan a two-year program that would not only inform students about all forms of media, but would also use media to provide them with well-rounded instruction. This instruction was in such areas as public relations, speech, salesmanship, drama as well as the required subjects, such as science, math, and history.

The use of multi-image presentations is succeeding at Santa Fe Community College. This special program was approved in the early 1970's and each term more students apply than can be accepted. The program has grown tremendously. It began in a hallway on the old campus, limited to a four-foot projection distance, four slide projectors, a dissolve unit, and a stereo tape recorder. The facilities have greatly expanded since then.

Students were provided with a standard, such as "How to Prepare a Multi-Image Presentation." They learned how to set up a flow chart, use a planning board, and put a program in the drums. At the end of the term a final film festival was held and the community was invited.

Picture III-1
Showing students how to insert slides in a drum.
AMI Collection

Today, in the introductory course, the student has a multi-image presentation ready by mid-term, and participates in a mini-festival. Then students re-work their presentations and present them at the final festival in the 360 seat auditorium which has three 16x16 foot screens that lower from the ceiling. Each student manually controls the buttons in the control booth for his own presentation; superior presentations are "digicued" (programmed) to show to future class sessions.



Picture III-2
Showing students how to sort and organize slides.
AMI Collection

The facilities now include three sets of equipment that are available for use at all times. One is in the media lab that seats 40 people; another is permanently set up in the auditorium that seats 360 people, and the third is taken "on the road" to share students' presentations with the community.

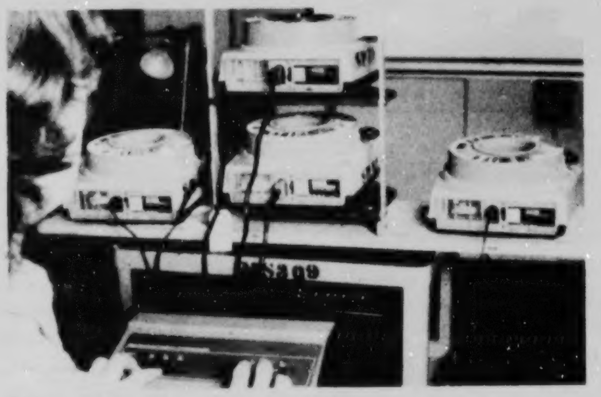
Educational Presentations

Since the early 1970's at Santa Fe Community College, 10,000 presentations have been shown to 160,000 people. There have been over 400 extra class sessions for instructors at Santa Fe Community College. Presentations have been shown for all the local high schools and middle schools, and many of the local churches. The college has participated in the Florida Association of Media in Education Convention each year. The first AMI (Association for Multi-Image) "How to Prepare a Multi-Image Presentation" Workshop was held at Santa Fe Community College.

Two hundred presentations are kept on hand for classes, for use in teacher in-service training programs, and for use at state and national conventions. A Santa Fe Community College student has won the State Media Award for each of the four years the award has been given.

Many of the presentations are used for regular teaching areas such as in history: "Civil War," "Never to Go to War," and "Flight"; or in the humanities: "Dali," "Michelangelo," "Vincent," and "Norman Rockwell."

The advanced students working with multi-image, schedule and program the presentations for various classes that attend each week. They also participate in the film festival and the traveling presentations, thereby gaining more experience in the use of multi-image equipment. The multi-image students are prepared for this from the "hands-on" sessions in the introductory course.



Picture III-3
A student programs a multi-image presentation.
AMI Collection

Business and Industrial Presentations

Multi-image is a most important and exciting form of communication. We can look to the examples of business and industry who have spent millions using multi-image presentations to get their messages across. Montsanto's multi-screen, "America the Beautiful," at Disneyworld and Disneyland is an excellent example . . . it uses ten film projectors with a complete circle screen to tell a patriotic story in pictures of America to the accompaniment of an appropriate musical soundtrack. Other examples are: telephone companies telling their stories in multi-image, as well as the use of multi-image by the military and corporations (such as Kodak) who use multi-image to introduce their new equipment.

We are seeing more multi-image than ever before. The significance attributed to the use of multi-image is evidenced by the number of conventions that appropriate funds for use in multi-image "kick-off presentations."

Multi-image is a lot of hard work. At Santa Fe Community College we do not have any staff to help execute the programs, so we use advanced students. It is worth the extra work because we are graduating students each semester and placing them at educational institutions to assist faculty and media specialists – to utilize multi-image effectively.

When you prepare and present a multi-image presentation to an audience and realize the effect it has on them, you will at that time have the answer to why we use multi-image presentations.

CHAPTER IV

THE MULTI-IMAGE PROGRAM TECHNIQUE WHAT TO USE

Part I JoNell Campbell

The multi-image technique relies at its most basic level on the combining of the best of aural and visual communications to reach the selected audience and achieve the desired objectives. All of the finest, most expensive, most sophisticated multi-image hardware available is only as good as the "soft-ware" it displays. The multi-image technique has the advantage of combining motion and still visualization and the advantage of using multiple images to convey information and increase aesthetic impact. In this chapter, attention will be given to (a) the creative process involved in developing the audio, (b) visual conceptualizing, and (c) the physical arrangement necessary to "get the show on the screen." It should be noted that the multi-image technique has certain basic steps any producer must perform; however, technique also involves style. Just as two novelists writing the same story will produce distinctively different pieces of fiction, two multi-image producers dealing with the same subject will ultimately incorporate different techniques in achieving the goals they desired.

The following, then, offers general guidelines, and is hopefully, a springboard to individual creativity.

The Audio

The audio track lies at the heart of any multi-image production, whether it be a simple one screen production of a few minutes duration, or a multi-screen extravaganza on the grand scale of *The New York Experience*. If the newcomer to the art of multi-image does not fully appreciate the importance of audio, he or she should try watching television without sound. Reverse the experiment and try listening without watching the picture. It should become clear at this point that communication relies most heavily on what is heard rather than on what is seen. In producing the sound track for a multi-image presentation there are four basic arrangements of sound elements: 1) the music only production, 2) the fully narrated production, 3) the documentary approach, 4) the combination of the above. (Since one entire chapter of this book is devoted to audio production, the technical aspects of recording will not be dealt with here in any detail.)

Music must be carefully selected. Music is the key to establishing mood, developing pace and molding the production into an entity with introduction, transitions, and conclusions. Music is often "borrowed" from pre-recorded sources. In addition to the individually purchased album, radio stations are sometimes sources for recordings. When using music from discs, care in handling the record cannot be over-emphasized. According to audio engineers, the high frequencies on a disc are lost with the first few needle drops. It is a good idea to get the music on reel-to-reel tape the first time a record is played, and then use the tape as a source for actual audio mixing.

Original music recording may not be as prohibitively expensive as it might sound. Effective original music can be obtained by "keeping it simple." Look for original compositions from "local" talent – students; folk musicians; hungry, struggling rock groups, etc. Try single instrument recording: a flute has many moods when played without accompaniment or orchestration; a solo banjo or guitar is hard to beat if it fits the overall tone of the production; a drum or drum set can provide excellent rhythm tracks; try voices a cappella. If, of course, budget is no object, seek out services of a near-by recording studio for a full treatment of original sound.

Always keep the visuals in mind during the music selection process. Sometimes certain pictures dictate exactly the type of music needed; sometimes the discovery of a piece of music will trigger new visual ideas – be flexible and devote adequate time to the selection of this very important audio element.

Picture IV-1
A commercial long playing record
Photo courtesy: Duane Troxel

Picture IV-2
A reel-to-reel tape
Photo courtesy: Duane Troxel

A fully narrated program is very cost effective. It has the advantage of simple production and advance planning; however, without a well written script and good delivery on the part of the narrator, it risks possible loss of audience attention, particularly in the case of longer productions. When selecting a "voice" for narration, keep the audience uppermost in mind. A student audience may be "turned off" by an authoritative "older" voice and vice versa. Try to record the narrator in a studio or spot isolated from extraneous noise that won't fit with the total program. Use a good microphone. Be willing to re-record until the desired effect is achieved. Seriously consider the use of several voices used in a pseudo dialogue. The alternation of voice character helps to retain attention.

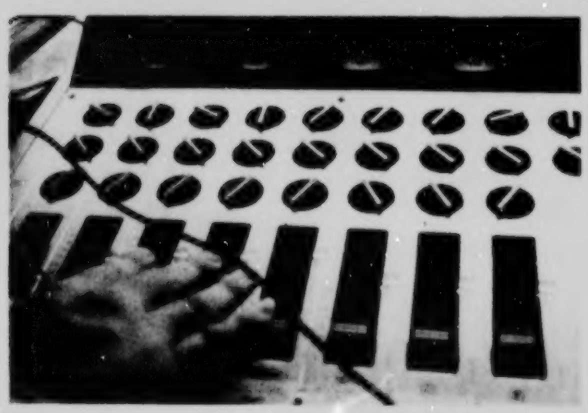
The documentary approach is one of the most powerful audio communication techniques. This involves location recording for authentic sounds; it involves getting away from formal scripting and letting the subjects speak for themselves – in their own way, in their own vernacular. It also involves a great deal of production time and often a great deal of editing. If the time and equipment are available, in this producer's opinion, the end result is well worth the effort involved. It helps if the reel-to-reel recorder can be battery powered, although line power will be available in most recording situations. Cassettes can be used, but this requires a dub to reel-to-reel for editing and tends to mean reduced audio quality in the final mix. Always use professional quality recording tape of 1.5 mil thickness for superior sound and ease in editing.

A producer using a documentary approach will do well to develop the required interviewing skills and to learn to use the editing block and razor blade. A typewritten transcript of interview or commentary tapes is to use along with the audio track also extremely helpful when editing.

The documentary approach is extremely valuable in productions with the purpose of persuading or gaining action from an audience. It provides an authentic credibility that is difficult to achieve in straight narration. However, since not all programs a producer makes are documentary in nature its application is by no means universal.

Combining the above audio techniques will almost surely require the assistance of an audio engineer and/or audio production facility. The ability to combine sound from several sources (e.g., a person talking, a music transition, a sound effect, etc.) requires a mixing board which can bring together these various sounds with proper volume control and get the desired effect onto the master tape. Some sophisticated tape decks have mixing capability, but it is usually best to locate a recording studio in the area, a radio station which will do production, or find an "audio freak" hobbyist who may be equipped to handle relatively complex mixing.

Picture IV-3
An audio mixing set-up
Photo courtesy: Duane Troxel



Picture IV-4
An audio mixing panel

Photo courtesy: Duane Troxel

An audio track that has been mixed offers variety and tends to "hold" an audience better than audio which uses only one technique. The end result is *usually* worth the extra costs involved. It should be noted that a producer who goes to the mixing session totally prepared with all preliminary editing done and all sound segments timed and clearly labeled *and* with a readable audio cue script will save money and nerves during the actual mix. [See Sample Audio Script]

Audio is vitally important. Audiences today have come to expect quality sound. They have been raised from the cradle with the best, most professional listening money can buy. Don't let a good visual production without quality audio techniques brand a presentation as "amateurish."

Sample Audio Cue Script

Program: "Getting Down to Grass Roots"
Client: Mid America Dairymen, Inc.
Producer: JoNeil Campbell
Page: 1

Music Intro: "Run Johnny Run" Side 1 Cut 4 Music Tape II

> Music begins up – hold for :35, then fade and hold under voice

Voice Tape #1, Cut 1:

> I've milked cows ever since I can remember. Back years ago we run an old cow out in the lot and set down and milked 'er wherever she stopped. That's just how long I've been in.

Music: ("Run Johnny Run" con't.)

> Up for :15 then fade out under following voice

Voice Tape #1, Cut 2:

> I believe dairying is it and if I didn't I wouldn't be building that new barn. (Sound effect)

Intercut Sound Effect: Cement Mixer

> Of course, that's my boy Jim's. He's done a better job of dairying than I did. Jim's a pretty good dairyman. I'm just a pretty good cow milker.

Sound Effect: Cow mooing

Music: "Tomato Vendetta" Side 2, Cut 1 Music Tape XV

> Music up for :25 then fade out under next voice

Voice Tape #1, Cut 3:

> I was about 35 when I really started thinking about coming back to the farm . . . .

The Visual Technique

How many screens? How can one screen be multi-image? If one is good, three must be better and nine would really blow their minds! Now . . . can't you figure out a way to put the whole thing on video tape?

The question of screen configuration figures prominently in any discussion of multi-image techniques. It is a question the standards committee of the Association for Multi-Image has been wrestling with throughout its short history of hosting festivals. In this writer's opinion, the question of how many screens of images and their arrangement demands thoughtful consideration on the part of the producer in two areas: 1) the purpose of the production and the physical consideration of the eventual viewing area(s); and 2) the possible screening of the production at national and regional festivals such as those hosted by A.M.I. and at the conventions of NAVA and AECT.

Purpose and Physical Considerations: As a general rule of thumb, it is best to never use more screens than one unless there is a real reason for doing so. For most productions, the one screen format is not only adequate but desirable. How can one screen programs be realistically called "Multi-Image" . . . by use of multiple projectors on the one screen area. This is accomplished with two or more projectors in combination with a dissolve system which alternately turns projector lamps on and off in a prescribed – usually programmable –

sequence. (The technique of dissolve and superimposition will be dealt with more fully, later in this chapter.)

One screen shows are advantageous when portability is a consideration; it simply requires less equipment, less know-how, less time to set up than multiple screen programs. One screen shows are also of greater advantage when the viewing area is known to be limited in size. *AND* one screen shows can be every bit as good and as powerful as can three screens *IF* the creative software that goes on the one screen is good. A one screen show can also be cheaper to produce (as a general rule), faster to produce, and is a good place for the inexperienced producer to begin. If the subject demands a multiscreen format for full impact, it is recommended by the Association for Multi-Image and by the experience of countless multi-image producers that no more than three image areas be used. There are several reasons for this: 1) Most viewing facilities are not built to accommodate "World's Fair-type" extravaganzas. 2) The three screen technique makes for very "viewable" presentations. The eye can easily take in three screens of information – more than three seems to distract from good communication and becomes only effect for the sake of effect. Wilson Brydon, a pioneer in multi-image production, poses the theory in his presentation *This Thing Called Multi-Image* (presented at a number of AECT Conventions) that the three screen format has historical continuity stemming from the triptychs (three image panels) of Medieval and Renaissance religious art. Whatever its historical justification, the artistic effectiveness of the three screen format seems to be widely accepted by producers and audiences alike. 3) The three screen technique lends itself well to visualizing steps in a process and therefore has strong educational value. 4) The three screen technique is good for dramatizing comparisons and contrast. 5) Finally, the three screen configuration is "a natural" for the powerful impact of the panorama – a single vista stretched across all screens. (How to shoot the panorama photographically will be dealt with in the chapter on "Producing the Visuals.")

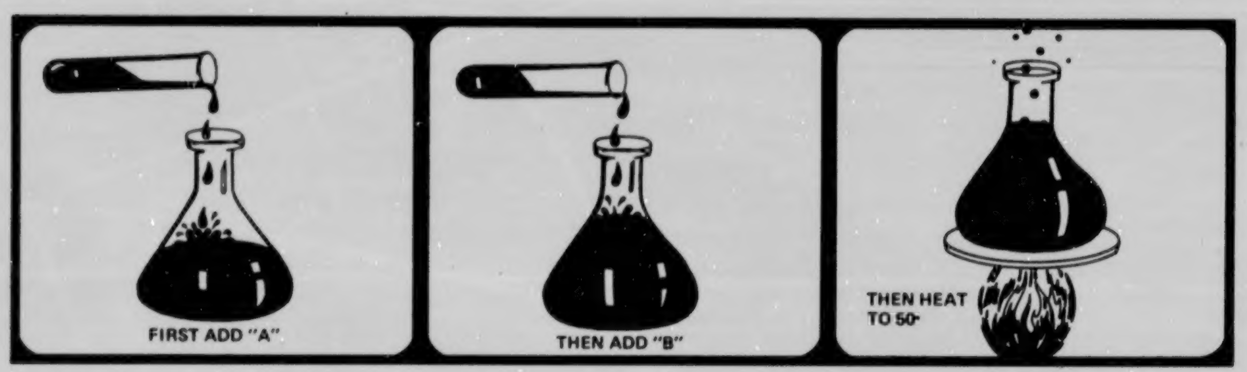


Illustration IV-1
Steps in a process

Illustration IV-2
Comparison and contrast

Illustration IV-3
The Panorama

In dealing with individual, single purpose productions, the producer may occasionally find a need for a format other than the two previously discussed. If an alternate format meets the purpose and fits the viewing facility, then the creative judgement of the producer should be exercised. A personal experience of the writer might serve here as an illustration. The purpose of one of our particular assignments was to communicate the University's need for the funding of an agricultural research station to a group of selected legislators. The room for viewing was quite small. We were specifically instructed not to overwhelm the limited space with several screens; *however*, the production needed to convey the many activities that took place simultaneously at the research station. It was decided that one screen would be used along with six projectors. Two of the projectors were attached to a dissolve and lens were used on these two projectors so that a full screen-size image was obtained. The remaining four projectors were fitted with lens which would project smaller images and were aimed at the four quadrants of the screen. [See Illustration]

The desired effect was thus achieved within the given space limitations. The above example is included to demonstrate that the multi-image technique can be creative even in the arrangement of image areas; however, this example is illustrative of a "non-standard" format. It was suitable for one particular purpose only; non-standard formats are discouraged as a general practice for a reason – and that reason involves the growth of the multi-image art form and the proliferation of producers and productions which brought about the formation of the Association for Multi-Image.

The Festival Format: In its hosting of festivals, the Association for Multi-Image seeks to fulfill the philosophy that programs once produced should have a screening place beyond the locality of the production. A.M.I. endeavors to provide a forum for the sharing of the creative efforts of many producers. Hopefully, the future will hold even greater extension of this philosophy as a "clearinghouse" for program exchange is established. The problems of showing many productions in a single area in a limited amount of time, and the hope for sharing multi-image programs as easily

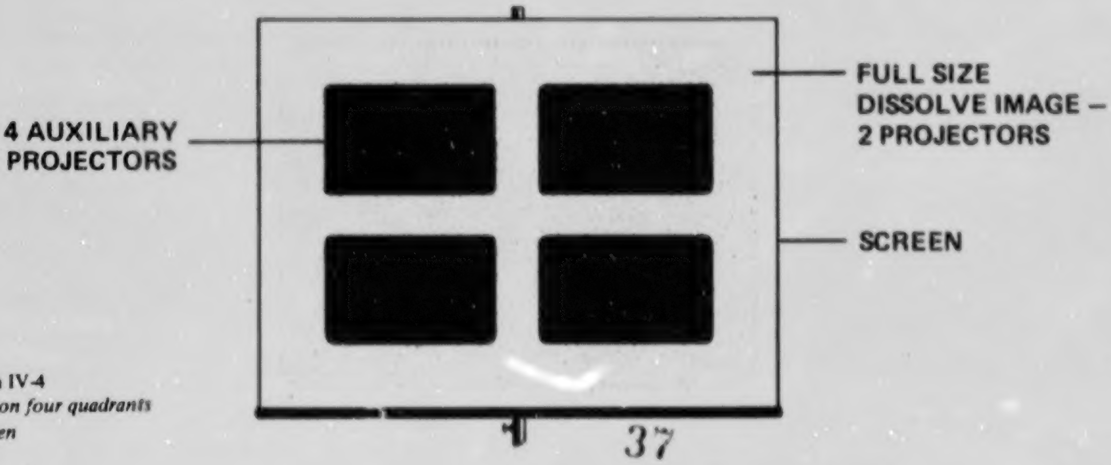


Illustration IV-4
Projecting on four quadrants of the screen

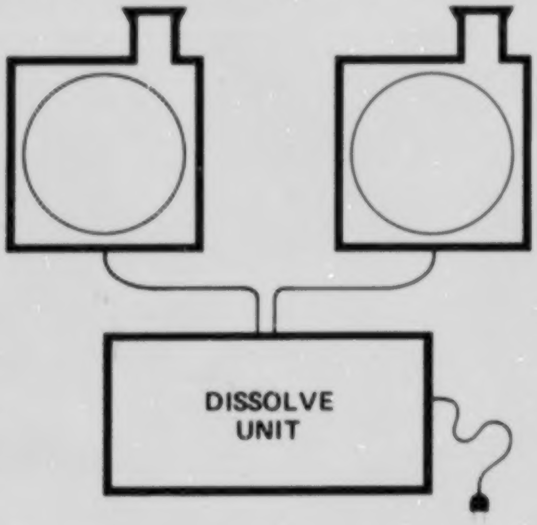
as one shares films, requires at least some general guidelines regarding format. Therefore, to participate in festivals on a regional or national level, producers are requested to use either one or three screen configurations. This restriction seems indeed reasonable when the growth of the art form stands to benefit.

Use of Slides and Motion Picture Film

All audiences are acquainted with motion pictures. Most audiences have been exposed to slide or filmstrip programs although not always in the multi-image format. The technique of multi-image combines still photography with motion photography approaches and sometimes with motion picture film itself.

Dissolving still images is an integral part of the multi-image technique and of multi-image equipment. The concept of the dissolve was "borrowed" from a motion picture technology. It involves "blending" from one image to another without the single projector's "click-click/black space" between slides. This is accomplished by connecting two slide projectors to a dissolve unit.

Illustration IV-5
Connecting two slide projectors to a dissolve unit.



The principle that makes the dissolve unit work is quite simple although the electronics in the unit itself can be very complex. Think of the dissolve unit as a box containing two oppositely gauged dimmer switches (much like a wall switch which allows a room light to be raised or lowered gradually). As the dissolve unit changes the dimmer's setting, it turns the lamp on one projector "up" while turning the lamp on the second projector "down." The result is a gradual, or "soft" transition between visuals. The capabilities of various models of dissolve units and their prices range considerably. It is even possible to build one's own although some commercially available models are priced competitively with the cost of the components necessary for a "do it yourself" job. Many reliable and inexpensive units are "programmable" – enabling the final product to be automated so that the show runs the same every time regardless of a change in operators. (See also the chapter on programming the multi-image presentation in this text.)

By careful photography, one can even simulate a "zoom" effect with the use of a dissolve. Carefully constructed graphics can add the effect of color transition to a visual (e.g., a yellow area on a slide in projector #1 aligned carefully with a blue area in slide projector #2 would pass through green during the dissolve process). Fades to black or up from black can be achieved by using a "blank" slide in one of the projectors. A "blank" is an opaque slide – commercially available and made from plastic or one can carefully cut a 2 inch square from illustration board with a mat knife.

While it is perfectly acceptable to do a slide show without dissolve, once used, a producer will find it distracting to go back to "click-click" presentations.

Superimposition is another multi-image technique borrowed from motion film. This involves placing two images on a single screen area simultaneously. It is often useful in titling although it can be used very creatively in achieving special visual effects. There are two basic ways of superimposing images on the screen. The first is mechanical – by having the lamps in two projectors "on" simultaneously. The capabilities of one's equipment is the key factor here. Check instruction manuals for dissolve and programming units to ascertain if superimposition is possible with the given equipment. A second way of achieving superimposition is within a single slide itself. This effect goes by a variety of names. If done with the camera, it is a double exposure. This can work very nicely if you can plan your photographs in sequence and accomplish correct exposure. If the superimposition is done within the slide mount, i.e., outside the camera, the technique is sometimes called making a "sandwich." The sandwich is made by selecting two complementary images. These images are removed from their original mounts and mounted together in a single slide frame. Two arrangements work particularly well: 1) having both slides slightly overexposed; 2) using one slide that has a strongly silhouetted subject that can be combined with a sky or light effect as a background. A particularly striking effect involves sandwiching a close-up of a face with a long shot of that same individual. It is often possible to make use of otherwise unusable over-exposures this way for very interesting special effects.

Using the multi screen format effectively: It would be especially useful for the novice to remember that when using a multiple screen format, it is not necessary – perhaps not even desirable – to constantly fill all screen areas with images. One of the "motion" tricks of using stills in multi-image is to keep the eye of the audience moving. Use placement of images to establish rhythms, to establish relationships between visuals, to establish divergent points of view, to establish placement of different speakers. A multi-image production need not have motion film footage in order to create a feeling of motion.

Using motion footage in the multi-image presentation: Another caution to the newcomer in multi-image is to avoid using motion picture film unless visual movement is really necessary and cannot be achieved with still photography. An excellent major entertainment production *Where's Boston** uses no motion footage at all, so rest assured that including film which moves is not the sign of a true "professional." If the proposed production needs motion footage, be aware that good 16mm work is expensive and time consuming to produce. Super 8 is more affordable but sometimes means a compromise in visual quality especially as regards the inferior grain structure of the Super 8 film.

After so many cautions about using film, equal time should be given to the power of blending moving and static images. The screen which has been filled with still photographs and then suddenly "blooms" with motion usually produces a dramatic effect as does using a single screen of motion picture film which slowly becomes a breath-taking three screen panorama.

It is a good idea to shoot still photography at the same time the motion footage is being done. This provides material for some nice effects when it comes time for the presentation. For example, a still picture can jump into action (or vice versa) without the expense of creating a freeze frame at the lab. Still shots of the subject for the motion picture can be projected on the outside screens while the action moves in the center adding increased impact to the treatment of the subject.

Film can more easily provide us with rapid animation than can most multi-image systems currently available. Film is also nice for "rolling" credits and can be superimposed over a projected slide.

Three final notes on film: 1) Film scratches easily and looks "old" with continual use. Since the same does not hold true of slides, allow in your budget for a second print if the show will be used frequently. 2) When setting up equipment for actual presentation, be aware of the differences in both the size and aspect ratios of the projected images if the slide projectors and film projector must be placed at the same distance from the screen. Using a Filmovara lens (or equivalent) on the 16mm projector will give some latitute in enlarging the motion image. 3) *Do not* try to sync sound on film with sound from a second source in programmed multi-image situations. It can be done but only with the addition of very sophisticated electronics including a modification to the 16mm projector. Silent motion picture footage in which the audio track for the slide component provides the sound is almost always preferable.

The Physical Arrangement

The physical arrangement of equipment for presentation is usually illustrated in detail in the operations manuals which come with dissolve units and programmers. Beyond this, there are probably almost as many ways to set up for a show as there are rooms where people gather. Thousands of dollars could be spent and volumes written in an attempt to create the perfect multi-image theater. There are some available and their number is growing, but since most producers display their work in less than perfect surroundings, some general set-up suggestions will be noted here. Most of the following assumes a front projection physical arrangement. (See also the chapter "Presenting the Multi-Image Program" in this text.)

1) Check out the physical facility *before* the set-up. It helps immensely to be able to anticipate problem arrangements. 2) Learn about the capability of various projection lens: lens size x distance from projector to screen = image size. Every Kodak projector comes with an operations manual which contains a projection distance chart. A choice of lens sizes gives flexibility of physical arrangement in various sizes of rooms. 3) Align dissolve images and superimposed images carefully so that they will appear on the screen as intended. Some producers use alignment slides which are commercially available; others use the panoramas for "lining up." 4) Project over the heads of the audience if at all possible. The stacking of two standard height tables – one atop the other – works well. It could also be noted that it is desirable to cover the card mazes in and about the tables with table clothes or sheets for a more

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**Where's Boston* is currently showing in the Prudential Building in Boston, Mass. (as of 1976).

pleasing appearance of the hardware. 5) Be aware of potential heads in the projection paths *before* the audience arrives. It may even be necessary to rearrange movable seating or to rope-off certain fixed areas. 6) Make sure power cords and speaker cables are not safety hazards by avoiding placing them across traffic paths. If this is unavoidable, tape them down securely. This not only prevents potential personal injury but also insures that all important connections do not get violently disconnected during mid-show. 7) Make a detailed list of all equipment and software needed for the presentation. Use it for getting there with everything needed and for coming home with everything that left the office. Then *file it* for future reference. 8) Determine beforehand the power-handling capabilities of the house wall circuits. If you are using a large number of projectors you may easily overload the circuit and start blowing fuses. If several circuits are available, find out about them and divide your power requirements appropriately, then locate ALL the unused wall connectors and tape them over with a clearly written note of what will happen if someone plugs added equipment in during your shows. Be courteous and remove all your covers before leaving. 9) Be prepared for emergencies – extra lamps, a duplicate copy of the audio tape, a copy of the script, extra audio cables and connectors (these are often the place where mechanical problems appear first), take back-up equipment along or know where it can be obtained quickly, flashlight, aspirin and/or "tums" if this is a first show. If your show is important enough, consider the value of paying for a complete set of duplicate slides so you can replace an entire tray of slides in case of a mishap. 10) Allow plenty of time for the set-up – better too much than not enough. 11) Be confident. If your preliminary planning has been thorough, the show should run without a hitch.

HOW TO ORGANIZE

Part II

Ron Slawson

The following is a diagram of how to prepare a multi-image presentation using one set of equipment from Santa Fe Community College.

FIGURE IV-1

HOW TO PREPARE A MULTI-IMAGE PRESENTATION

STEP I
1. Idea (theme)
2. Storyboard (idea development)
3. Sound track (in conjunction with overall theme)

STEP II
1. Look for pertinent slides in slide file or photograph your own
2. Take slides needed with the Instamatic Visual Maker or 35mm copystand

STEP III
1. Arrange slides on light table in order of appearance using the script of the sound track as a guide

STEP IV
1. Contact multi-media personnel to check timing
2. Insert slides in trays

STEP V
1. Schedule equipment for rehearsal with multi-media personnel

STEP VI
1. Schedule equipment for final presentation with multi-media personnel

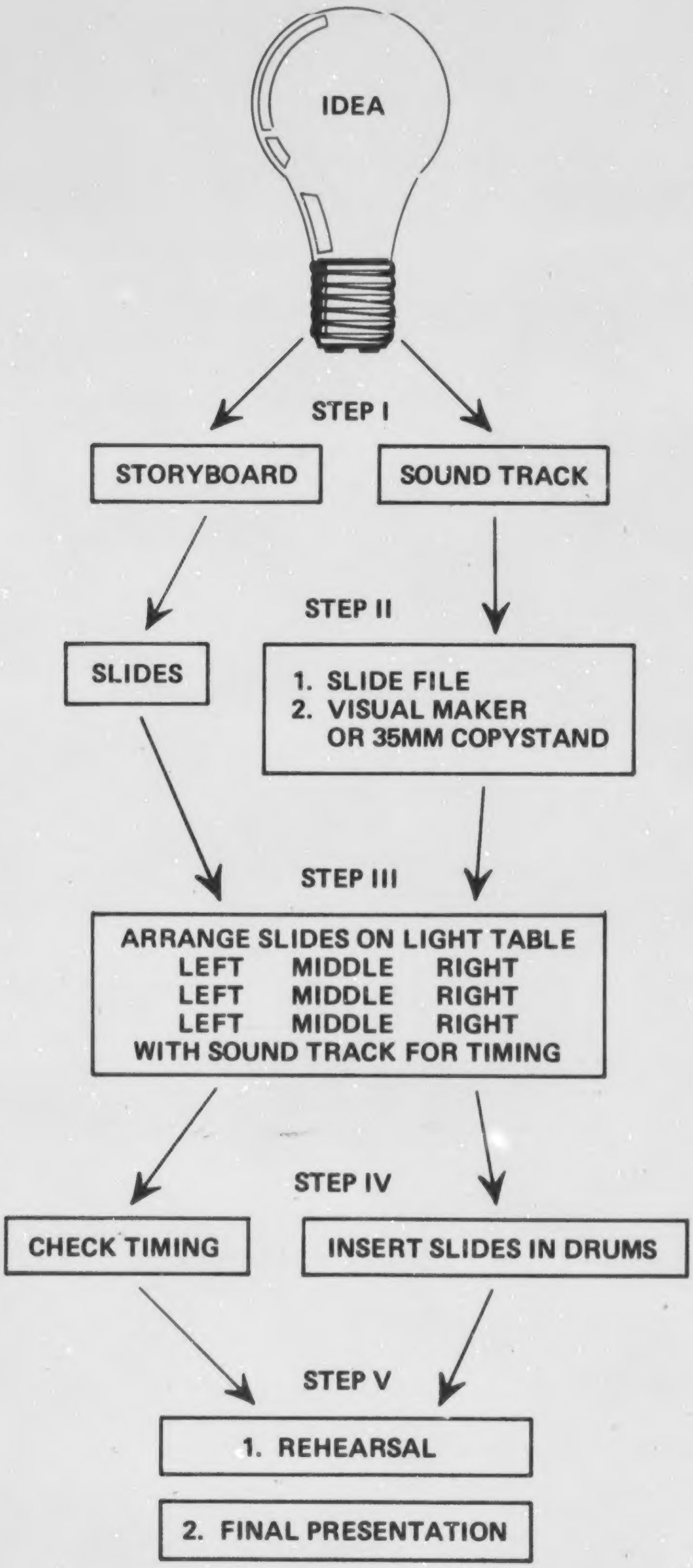


Illustration IV-6
Flow Chart of a multi-image presentation

FIGURE IV-2

PLACING SLIDES ON LIGHT TABLE

A. For three image presentation
  1. Place three blank slides
  2. Place your two outside images remembering that your middle image is dissolving.

IMPORTANT IT TAKES THREE SECONDS, WHEN USING THE DISSOLVE UNIT, TO GET COMPLETELY FROM ONE IMAGE TO THE NEXT IMAGE.

* KEEP THIS IN MIND FOR TIMING PURPOSES. WHEN USING THE DISSOLVE UNIT. YOU HAVE AN OPTION OF USING A THREE SECOND, NINE SECOND, OR QUICK CUT DISSOLVE PROCESS.

  3. Use blank slides for outside images when you want only the dissolving image to appear.
  4. End with three blank slides.

B. For one image presentations
  1. Place two blank slides
  2. Place one row of slides
  3. End with blank slides

FIGURE IV-3

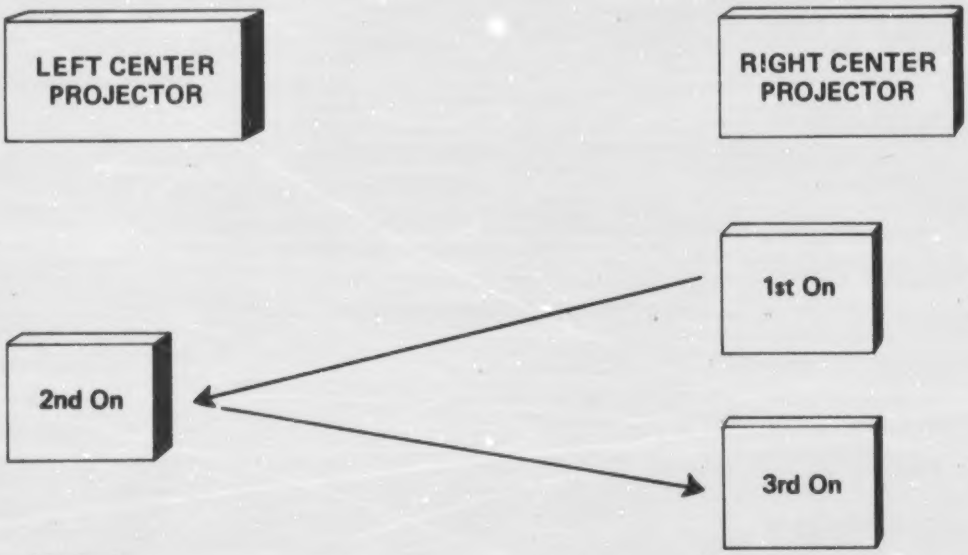
INSERTING SLIDES IN TRAYS

A. For three image presentations be sure to lay the slides out on the light table exactly as you see them on the screen (Left/Middle/Right). Alternate the center row in the two middle drums starting with the first slide in the right middle tray.

LEFT	LEFT CENTER	RIGHT CENTER	RIGHT
BLANK SLIDE	BLANK SLIDE	BLANK SLIDE	BLANK SLIDE
SLIDES		1st On	SLIDES
	2nd On		
		3rd On	

  1. Place four blank slides in.
  2. Your left and right slides go into their respective trays.
  3. Place your middle slide first into right center. From there alternate from tray to tray placing a marker into the middle of the tray of the last inserted slide to remember your place.

Illustration IV-7
One image presentations



1. Place two blanks in.
2. Same as #3 for three image presentations.

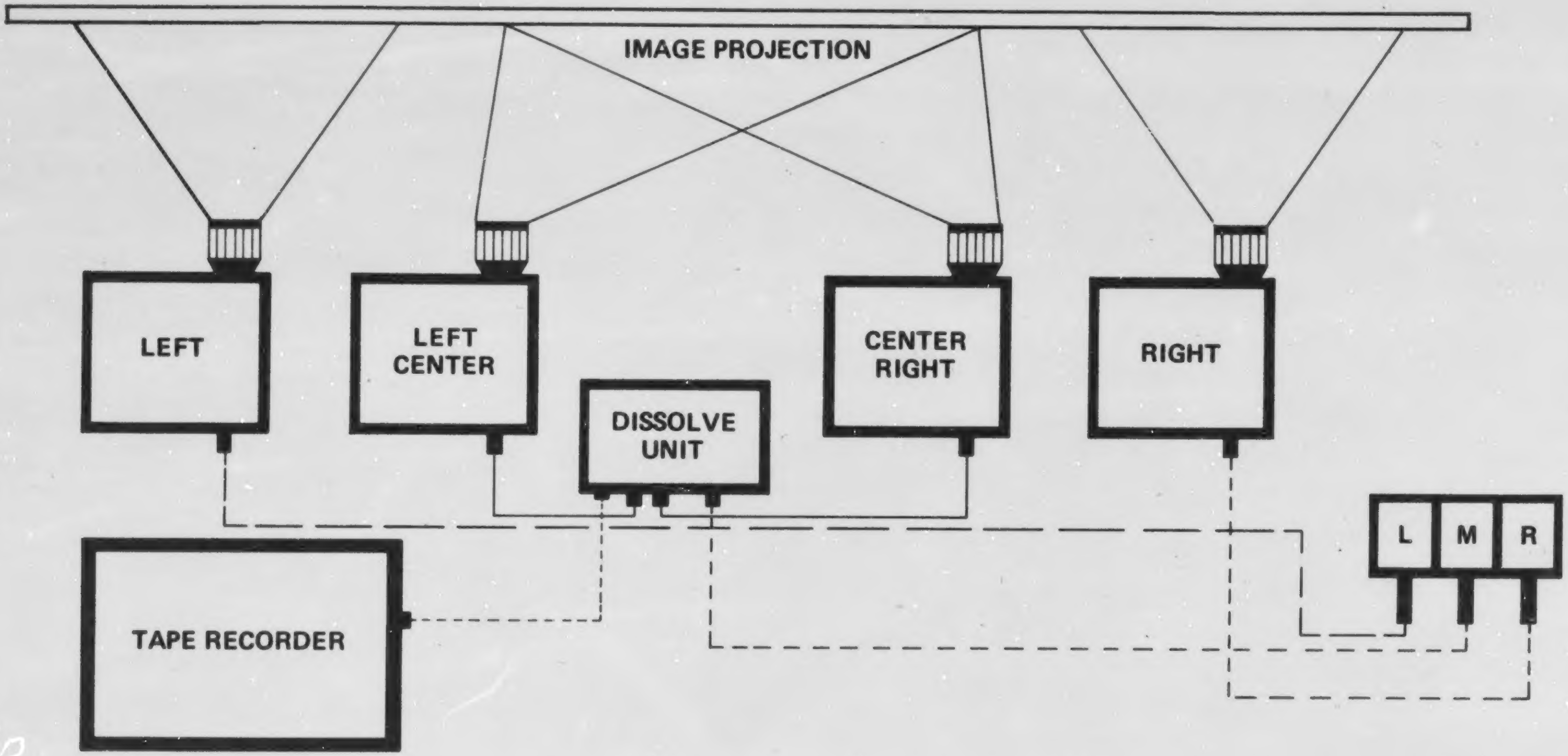


Illustration IV-8
A Multi-Image Set-up

CHAPTER V
PLANNING AND WRITING THE PROGRAM

Palmer E. Dyer

Good multi-image programs can offer much, both in terms of audience involvement and in creating a high interest level. Poorly conceived programs with a hit-or-miss approach and no clearly identified objectives will most often fail to provide any meaningful impact on its viewers. For example, one prevalent multi-image programming error is that of continuously filling each screen merely for the sake of "completeness." When one has decided in advance why each image needs to be where it is, such errors are less likely to occur, for the producer attempts to be constantly aware of the direction to be taken. When we are dealing with instructional multi-image programming, we are aiming for a very precise goal, and that is to teach someone something rather than simply providing a dazzling display or a mind-boggling experience devoid of content and purpose.

There are a number of studies that support the hypothesis that picture and spoken word combinations are effective in the communications process – but, communication of what? In some instances, the lack of specific objectives may well communicate that which McLuhan has suggested . . . that the medium is the message. This has a high probability with most multi-image programming for all too often the viewer has said it was a great program, I thoroughly enjoyed it, but I learned nothing. Again, if you have developed a program simply to arouse, or alert the audience, you can consider such comments as evidence of a successful motivational presentation. If, on the other hand, you had intended to develop an instructional unit, you have failed. Thus, there is little need to spend a great deal of time identifying instructional objectives for the motivational type program. (However, outlining psychological, compositional, and artistic objectives may serve the producer extremely well.) The success of the motivational program can be measured in terms of audience appreciation.

What about the instructional multi-image program? Here the producer is aiming toward a precise goal and it becomes essential that the parameters of the program be clearly delineated.

Setting Objectives

Preplanning is best accomplished by clearly determining the desired outcome and then writing narrowly defined objectives to meet that goal. If *you* are a true "gestaltist" and follow the dictates of Kohler, Koffka or Wertheimer, *you* may be ready to stop at this point and select another mode of instruction. If, however, you find the research outcomes of Thorndike, Watson, and Skinner more convincing, then the necessity for writing specific behavioral objectives for your multi-image instructional program should be quite evident.

The first step is to identify the broad scope or theme of the particular program unit *you* are developing. Once established, the thematic approach should readily lend itself to the drafting of the more narrowly defined, specific, objectives for each segment of the presentation. For example, a multi-image instructional unit could be developed on the broad theme "Modes of Transportation." From this broad category of all transportation, we could move to subdivisions of ground, water and air transportation. A further narrowing of focus would move from all ground transportation to specific modes such as automobiles, trains, busses, and so forth. At each step along the way, from the broad theme to the subdivisions, specific program objectives can be written.

In using this thematic approach, the multi-image producer has a blueprint for instruction, a guide that should aid him in designing a program that will be effective in meeting his stated goal. Now the question becomes: how specifically must my objectives be written? There are no hard and fast rules regarding the writing of specific objectives for multi-image programs. However, the developer of objectives must not only identify the topics to be discussed but carefully determine what aspects of each topic must be understood, what kind of understanding should take place, and in what observable manner successful understanding should manifest itself, i.e., the producer should know just "what" and "how" the audience is expected to learn the content. Generally, it is accepted that the more narrowly the program objectives are defined, the more likely the program will effectively transmit the desired message. With precise objectives, the producer is less likely to digress from the topic or to become engrossed with the technology and lose sight of the original program goal.

The multi-image form of message transmission is definitely suffering growing pains. Some individuals start to develop multi-image programs on the basis of the hardware or technology available to them, while some programs have been generated solely on the basis of utilizing a selection of slides found in some file cabinet. One may, with luck, develop a successful instructional multi-image program on these bases, but the odds are against it. If the program is strictly of a motivational or aesthetic nature, then starting with the hardware or even with an available body of slides may result in an acceptable program. But, if the program is to meet an instructional goal, the best basis from which to generate an effective unit is from clearly defined objectives.

Now the multi-image producer has a direction. He or she should know quite well where to proceed next and the specific objectives should have been developed to insure that the instructional aims are met. Now comes writing a script, developing a storyboard, shooting the slides, and making the audio tape. Or, is the sequence: develop a storyboard, write a script, shoot the visuals and then make the tape? Even though most instructional multi-image producers would agree that the first step is to write good, clear objectives, there is not the same clear-cut agreement as to sequence of the steps that follow in developing the final program.

Scripting the Program

Many people feel that the key to any successful multi-image program is that of writing an appropriate script, one in concert with the stated objectives. When this step is completed, one develops a storyboard. Others argue that the second step in the sequence is that of developing the storyboard from which one then determines the script and visuals needed to make an effective program. It becomes a moot argument when one considers that the storyboard is a production tool while the script is actually a part of the finished program. For our purposes, we will attend to the area of scripting first and then discuss multi-image storyboarding.

A major problem facing the multi-image producer is that of determining just how much narrative will be necessary to insure that the desired message is communicated and the program meets the stated objectives. One of the inherent dangers in developing any slide/tape program is that of being too wordy. Excessive narrative leaves a visual on the screen for too great a length of time while the dulcet voice of the narrator describes what one is viewing or imparts information relevant to the visual. Whether it be a one-screen or multi-image presentation the effects of over-verbalization can be devastating. Obviously, the converse is equally true when one attempts to overwhelm the viewer with a sequence of too complex or too detailed visuals without either providing adequate explanation or allowing sufficient time to digest the information presented.

Many producers fail to fully accept the fact that multi-image is essentially a visual medium, and fail to take full advantage of the uniqueness of this form of communication. When scripting a program, the novice producer tends to draw on past experience of writing scripts for audio programs or single-screen presentations. There is, or at least there should be, a considerably different approach used in working with multi-image.

The first step in developing a good script for multi-image presentations is to think in visual terms. This may seem self-evident, but it is far more difficult than it appears, for characteristically one tends not to visualize verbal or written statements. The attempt is to articulate a specific point and permit the listener or reader the latitude of supplying the visual interpretation of the statement. In multi-image programming the visuals are supplied and the primary emphasis must be on what appears before the viewer – not on what may be heard from the narrative accompaniment. The key word is *primary* emphasis, for obviously, no one would intentionally write a script that was not in concert with the visuals on the screen.

An experienced producer capitalizes on the visual aspects of multi-image. If too much narrative becomes essential to communicate the desired message then it may be wise to re-evaluate the motives which led to the choice of developing a multi-image program. It would be considerably easier, and perhaps far more effective, to develop a single-screen program where the visual impact is not nearly so dramatic and would not detract from the narrative explanation. It is an accepted practice in single screen programming to use a visual to support the narrative. The desired message, the content, is presented by the narrative and the visual is used to amplify or clarify the spoken word. This is not the case with multi-image programming. Here, the visual must remain the primary source of message transmission.

Is music an element to be considered when scripting for multi-image? Many multi-image producers question the need for or even the desirability of using any music. Their contention is that the visuals, with limited narrative, should be adequate to carry the message of an instructionally oriented, conceptually sound program. Others, however, consider any program to be incomplete without music in the background, rising at the appropriate moment to provide dramatic emphasis to the visuals. This can become a pointless argument, since valid rationales can be presented for either position.

The crucial requirement is that when a producer does elect to use music, it emerge as integral to the program as are the visuals or the narration. All too frequently, a music selection which is so selected as to amount to an "additive," not only fails to contribute to the effectiveness of the program, but may very well prove to be a detracter. A clever lyric of a current song, a fascinating beat of rhythm, or a haunting melody may instead serve as a formidable obstacle to meeting the program objectives. The lyrics may distract from what is seen, the rhythm may not match the image changes and provide a severe discord. Programs that are conceptually sound may be doomed to failure through the careless or casual selection of music.

If music is to be a part of the multi-image program, it must be considered as an integral part of scripting. An analysis of both the specific objectives, as well as of the mood that is to be created, will aid the programmer in determining what type of music, if any, will effectively contribute to the program.

Another problem many multi-image producers face when scripting a program is that of being too clever with the narrative. They forget they are dealing with *multi-image* – a visual medium and their avant garde approach results in conflict between sight and sound. If the purpose of the program is to create a "happening," an experience, then such conflict may be acceptable. If the goal is to develop a strong instructional unit, such conflict reduces the probability of successfully meeting program objectives. The key is to keep the script simple and direct.

Remember for whom and why the program is being written. Again, a constant review of the program's interests and purposes is necessary to avoid poor, ineffective scripting that detracts rather than supports its goals.

Now that the specific objectives have been identified and the scope or perimeter of the program defined, the basic script should be written and verified to be in concert with the stated objectives. The next step is to develop the storyboard.

Storyboarding

The storyboard is the producer's blueprint for action; a set of guidelines that will aid in the visualization of the program objectives and narrative. A well constructed storyboard will assist the producer in determining the precise sequence and pace of the program so as to insure that each objective and sub-objective has been given adequate treatment. Some objectives can be met with limited visualization and narration while others require extensive treatment.

In instructional multi-image programming, the storyboard is an essential production tool. It is a series of individual cards by which the producer indicates the exact visual wanted for each screen and the narrative which will accompany the visuals. It is at this stage that the producer has to determine what visual effect will best communicate the information needed to cover each specific objective. By making rational and sound decisions at this stage of production, the producer can save much time and expense prior to doing the photography for the program. By following the storyboard, the producer knows precisely which slides must be taken and is less likely to fall victim to the most common error found in instructional multi-image programs – the use of extraneous or irrelevant slides that do not contribute to content. For example, if it is determined that a close-up, medium, and long shot of the Statue of Liberty are needed to meet a specific program objective, nothing else will do. Three well photographed wide angle views would not suffice – the objective requires three different views from varying ranges.

Storyboarding for a non-instructional multi-image program, an emotional appeal or a mood program, may not always be essential. In fact, the constraints of a too rigidly conceived storyboard may prove to be an inhibiting factor rather than a help. In such programming, the inclusion or exclusion of any given visual is usually based on the emotional appeal that the visuals can elicit or the degree to which they can contribute to the desired mood. Since no specific objectives may have been written, the producer should be given wide latitude in selecting which visuals are to be included in a program.

Developing a storyboard for an instructional multi-image program need not be a formidable task. The key is to keep it simple and to constantly think in terms of multi-image visualization. Avoid drawing into the story-board all non-essential and needlessly time-consuming graphic details by including only the elements crucial to meeting a specific objective. The use of stick figures and simple, although rough outline, figures can be adequate to meet most needs but, as with any road map or blueprint, sufficient detail to provide the photographer with a clear understanding of what is intended is a must.

The following is an illustration of a storyboard card for a single screen program:

This card contains all the information needed by the producer to insure proper direction and to avoid costly production errors. "A" refers to a simple sketch or rough outline of the desired visual; the letter "B" identifies a brief notation or description of the visual; letter "C" is the exact location for the narration which will accompany the visual; and letter "D" gives us the sequence number.

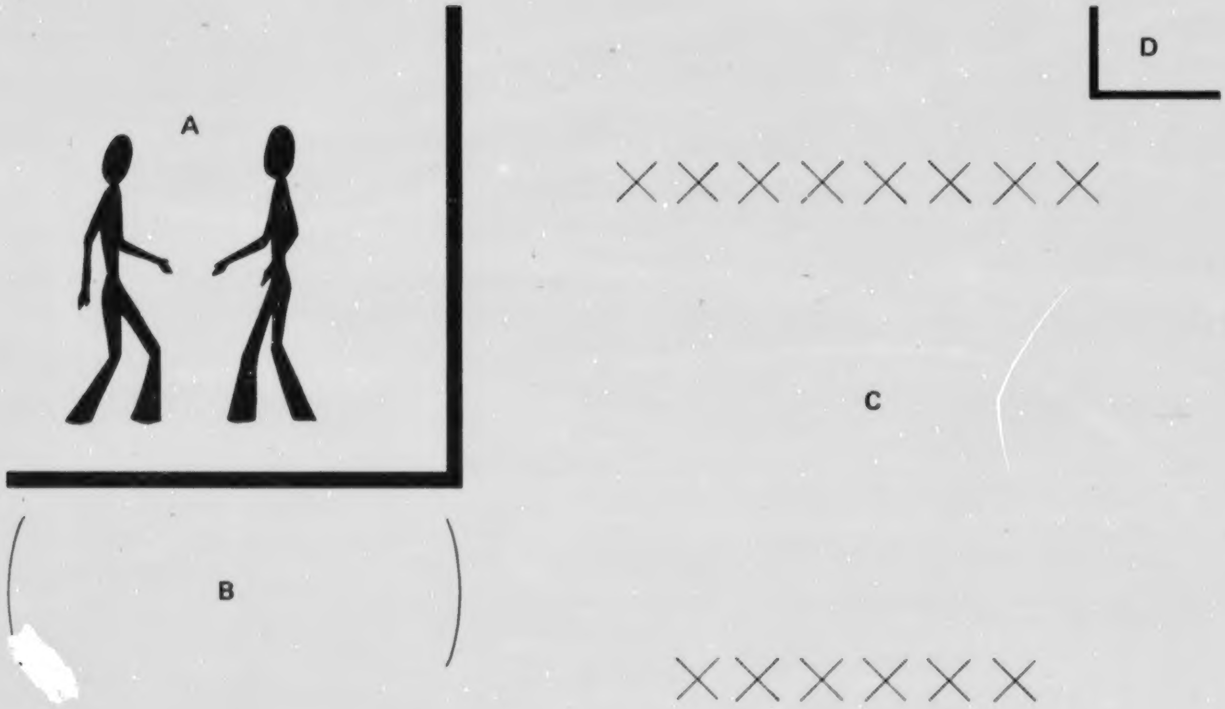


Illustration V-1
A storyboard card for a single screen program.

A storyboard card for a multi-image program contains the same information found in the single screen illustration with one major difference. That difference, of course, is the need to account for the multiple screens at all times. If a screen is to remain black or if a super-imposed image or dissolve is to be used, it must be noted on the card.

Illustration V-2 shows a storyboard card for a multi-image production.

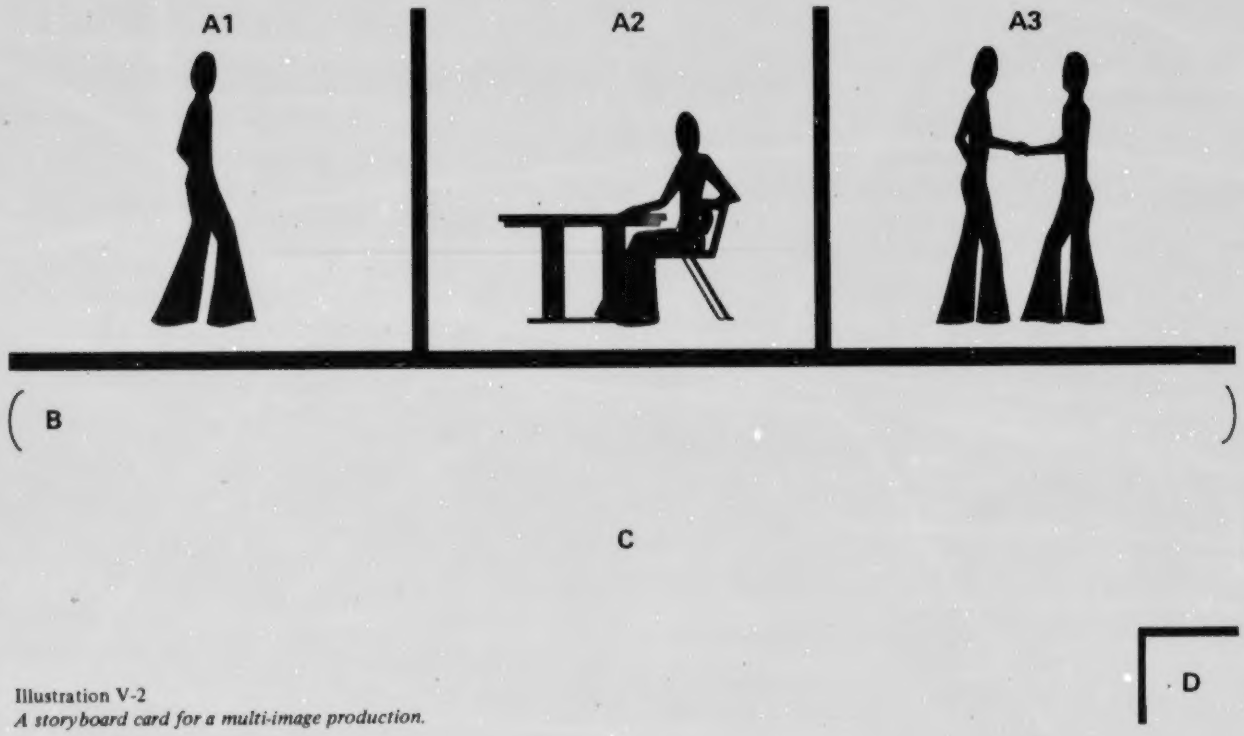


Illustration V-2
A storyboard card for a multi-image production.

A properly executed storyboard gives the producer the direction needed to begin the photographic aspect of the program. In fact, it would be possible to produce the audio portion of a program even before the visuals have been prepared. While this is not usually done, it does emphasize the value of committing time and effort to developing a good storyboard, one that insures that all the instructional objectives have been given adequate attention.

Some individuals have criticized the multi-image form of message transmission on the basis that the technology available exceeds the producer's capacity to effectively utilize the medium. Perhaps what is really being said is that all too frequently, a lack of attention to the pre-production writing of the objectives, the script and the storyboard results in programs that fail to make a positive contribution to instruction.

As examples of readily available pre-printed forms to help in scripting and in storyboard development, the following two pages show two that can be obtained from the 3M Company. The storyboard form is specifically designed to be compatible with programming equipment sold by the 3M Company.

Title: ______________________________

Page: ____________________ Date: __________ 19______

Multi Image Storyboard

Visuals	Keyboard Keys	Cue No.	Audio
A B A B A B	123 456 789		
A B A B A B	123 456 789		
A B A B A B	123 456 789		
A B A B A B	123 456 789		
A B A B A B	123 456 789		
A B A B A B	123 456 789		
A B A B A B	123 456 789		
A B A B A B	123 456 789		
A B A B A B	123 456 789		

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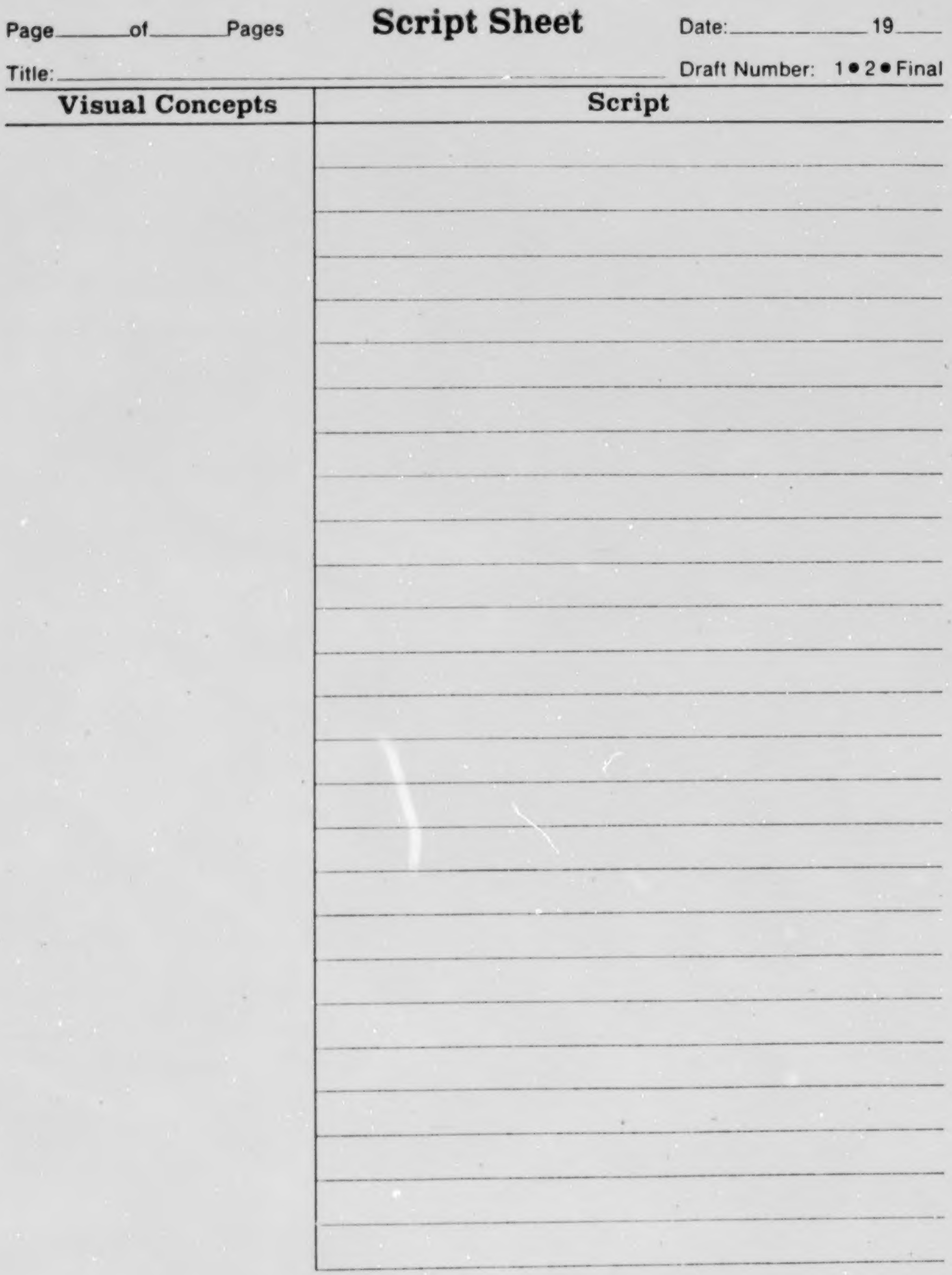
RM-MIPSBS

Figure V-1
A multi-image storyboard

Courtesy 3M Company



Page ______ of ______ Pages

Script Sheet

Date: __________ 19____

Title: ________________________

Draft Number: 1 ● 2 ● Final

Visual Concepts	Script

Figure V-2
A multi-image script sheet

Courtesy 3M Company

CHAPTER VI
PRODUCING THE VISUALS

A. Arvo Leps and Hans-Erik Wennberg

There IS no multi-image show without the images. The quality of the images will make or break all shows – even with brilliant narration, superb musical accompaniment, and splashy sequencing of visuals, if the visuals themselves are dull, poorly produced, or confusing, the result will be unacceptable. Thus every producer must invest a substantial portion of his or her overall effort to the production of the visual content.

What Are The Choices ?

These visuals are almost invariably projected full-frame 35mm slides. They need not be, but the exceptions are rare – perhaps such exceptions should be explored more extensively and creatively. Let us mention some of these possible exceptions briefly and then dismiss them as far as this book is concerned.

There are Exceptions to the 35mm Slide as a Visual.

First, we must mention that multiple images need not result from multiple single projectable items. Some of the most spectacular multi-image presentations have derived from only *one* motion picture film – i.e., the multiple images were incorporated into one piece of film stock. This exception will be discussed briefly in a later chapter.

However, using multiple "sources," multi-image presentations can result from multiple simultaneously projected films (35mm, 16mm, 8mm, or Super 8mm) or even from recorded or computer synthesized television programs being played back simultaneously over several monitor/receivers that are grouped in some arrangement before the viewers. A presentation could consist of multiple holograms, multiple live actors exhibiting either still and moving visuals, multiple projections of dye-flow images placed on overhead projection stages, multiple kaleidoscopic or spinning polarizing disc projections, multiple laser diffraction pattern projections, planetarium projections, or all of these combined in infinite possible permutations. At some point or other all these and more have been presented with varying success.

All of these required the preparation of some kinds of materials for their visuals – and all of these techniques deserve chapters of their own. But not in this book.

Not even slides alone are a sufficiently limiting consideration. Slides can be produced in a number of formats: these can range from the tiny Kodak 110 format through "superslides" (all in 2 inch by 2 inch mounts) and on to the various so-called "lantern slides" in sizes up to 4 by 5 inches and beyond. Finding automatic projection equipment for slides larger than what would fit into the 2 inch by 2 inch format presents a horrendous problem – but one that is challenging enough to invite solutions.

What will be projectable in the 2x2 slide projector? Obviously, the standard 35mm slide qualifies but one can also show a 40mm by 40mm "superslide" (frequently sold in curio stands), a typical "half-frame" slide (usually seen in filmstrips – which themselves could indeed be incorporated into a multi-image presentation), as well as nearly anything smaller (down to the Super 8 "chip" and color microfiche). A recent innovation is the Kodak "Pocket Carousel" designed to permit fully automatic projection of the compact-format 110 slides – a format already being used by multi-image producers anxious to reduce the bulkiness of their equipment. So much for the more prominent exceptions.

The "Standard" 35mm Slide

The great majority of multi-image producers will do their work using standard-format 35mm slides. Just what are the dimensions of a 35mm slide? We must remember that in actuality there are two sets of dimensions to take into consideration. One is the actual image that the camera forms on the strip of a 35mm film, the other is the area visible within the conventional commercial slide mount.

The multi-image producer is *not* constrained to the use of the standardized commercial mount, and thus an entire wealth of alternatives is available to those interested in using them. These will be discussed under the headings of "mounts and masks" later in this chapter.

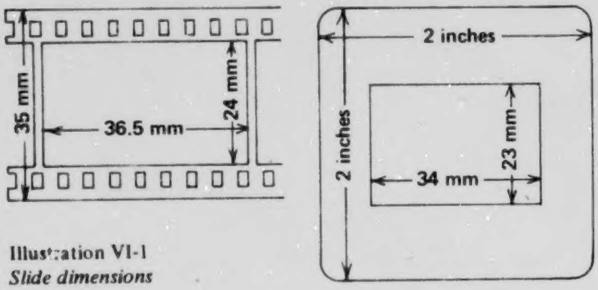


Illustration VI-1
Slide dimensions

The Various "Conventional" Approaches to 35mm Slides.

"The color slide"

The most obvious, although by no means the best, way to obtain 35mm slides is to photograph color transparencies with a camera, using the "real" subjects within the environment, i.e., "go out and take slides." This has the advantage of providing the best possible grain and visual fidelity (depending upon the skill of the photographer) and allowing the photographer the choice of seeking out what is desired and then attempting to photograph it. (Note, not nearly all such "attempts" will however result in usable slides.)

The disadvantages are that the material desired may not be accessible at all – it may have vanished like a canyon flooded by a lake – or it may be extremely hard to get to – say, photographing a wildebeest, or DaVinci's "The Last Supper" (who will permit you into Milan's monastery refectory with a dozen powerful lights?) or snapping a smiling closeup of Ms. Jacqueline Onassis or getting the view from the top of Mt. Everest, as possible examples. Yet there are plentiful excellent photographs of all these available with only a few hours research in most libraries. Whether or not to make use of these resources is a terribly complex legal decision involving a constantly changing (and constantly reinterpreted) copyright law. Again, not a concern for this chapter.

"The color duplicate"

This leads us to the obvious next step, the duplicate color slide. Not only does the duplicate offer us access to hard-to-obtain material but it also provides the producer with a great deal of after-the-fact control. Even with slides photographed earlier by the producer himself, there may be reasons for altering the way they are presented. Perhaps one needs a segment of a slide, perhaps the tonal balance must be changed, or a dark slide lightened or vice versa, or one may need a "blow up" of a small area of a photo, or the single photo should be converted into three side-by-side slides for a panoramic effect – all of these require rephotography. Similarly, of course, one can rephotograph printed photos, halftone color or black-and-white prints, large transparencies, . . . you name it. The advantages are the increase in control and availability of resources. The disadvantages, however, are also many.

Every time a picture or slide is rephotographed there is more-or-less noticeable degradation of image quality. A second, third, or fourth "generation" image is never quite as good as the original. Then there are the aforementioned legal and ethical ramifications, i.e., are you stealing something? Lastly, there are the problems of added equipment and skill. To do acceptable rephotography requires fairly good quality optics, special close-up devices, a copy-stand or equivalent, possibly a slide duplicating device, properly positioned lights of the appropriate color temperature to match the film being used, and for truly outstanding work with repetitive images, the devices needed for precise positioning (i.e., registering) both the work being photographed as well as the film in the camera. To use these devices requires the acquisition of additional skill – something that the average photographer may not have and that take time to acquire and need plentiful opportunities to succeed and to learn from failures.

"The black-and-white transparency"

The least complicated way to photograph existing black and white material is with color film – taking pains to assure that the illumination tonality (i.e., color temperature) matches the film type being used. This saves the photographer the task of processing the film oneself and yields an immediate positive image.

However, black and white (as well as color material) *can* be photographed with black-and-white film. The problem is that this results in a negative which either must be transformed photochemically into a positive image on film (i.e., reversal processed) or else rephotographed (either in a camera or a "printer") to yield a second positive image. Both of these require considerable darkroom skills and more equipment as well as time. However, in the long run, these may save the producer money – color film is far more expensive than black and white.

There is *one* extremely attractive use of black-and-white film that does not necessitate a positive image. Indeed the resultant negative quality will be exploited to its fullest. And this is the use of high-contrast copy film, such as Kodak's Kodalith Ortho film, Type 3 (in 100 foot rolls it's labelled as type 6556). Such film is usually sold in bulk rolls and must be spooled into cartridges by the user or by some intermediate film handling service.

If properly exposed and processed this film yields only totally opaque black and absolutely clear "white" images. The projected results are luminous images on a black background – an image that holds the eye and is easy to read, if used to present text. To add character, the clear areas are easily colored using several techniques and in almost any colors which consequently blend in and superimpose pleasantly with other color visuals. Unlike producing positive continuous tone, black and white transparencies, this process is comparatively simple and speedy.

These are the major categories of slide types. There are, as with everything else, exceptions that are used by the sophisticated producer, but they lie beyond the scope of this discussion. To mention some, for recognition value, one could use solarizations, the so-called "bas relief" effect, infrared emulsions, and others.

Projection Format Considerations

The use of multiple images immediately raises the possibility of using expansive formats and larger than usual visual areas. This opportunity can be utilized fairly straightforwardly or one can be innovative and try any of many possible arrangements.

The "Aspect Ratio" and What to Do With It.

The term "aspect ratio" refers to a ratio made up of the two dimensions of any visual area, its width versus its height. We'd indicated that the actual 35mm image area was 36.5mm wide and 24mm high, whereas the opening in the standard mount measures 34mm wide and 23mm high (to allow for inaccuracies when binding the slide). Both of these approximate a ratio of 3 to 2 or 3:2. This results from dividing both dimensions by the common denominator of 12 and rounding off.

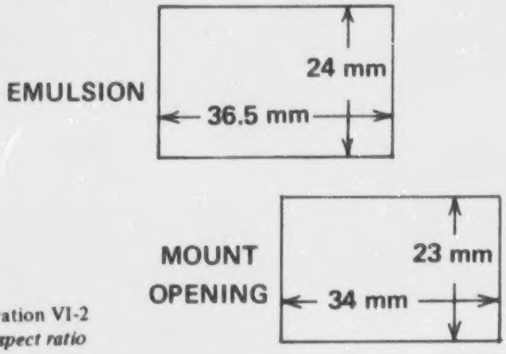
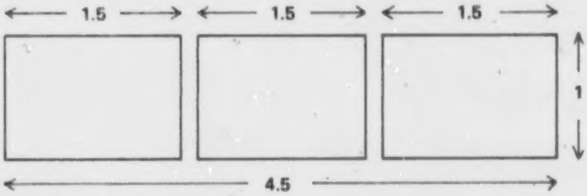


Illustration VI-2
The aspect ratio

A way of standardizing so as to make comparison of aspect ratios easier is to make the smaller dimension always equal to unity, thus the standard slide format could be expressed as 1.5:1 instead of 3:2. In terms of this convention, the most popular version of multi-image presentation – one in which three horizontally oriented slides are projected side by side with no significant gaps between the images would result in a combined aspect ratio of 4.5:1 as seen in Illustration VI-3. Wider aspect ratios are attainable by simply adding images but since man's peripheral vision barely extends further, those seated close to the screen would need to physically sweep their eyes back and forth to capture what is shown.

Illustration VI-3 *Combining the aspect ratio*



Screens, and How to Select and Use Them.

Although the choice of a screen is a matter of presentation, it will dictate how the visuals are to be produced and should be determined beforehand. If a program is conceived for presentation at a fixed site, such as a corporate board room, an advertising demonstration room, or a training facility, then the physical space will partially dictate the dimensions and the resulting aspect ratio. The result may be a 180 degree wrap-around screen, a totally encircling screen, or a standard square format screen. If the program is conceived as being portable, to be set up at various sites on short notice, other factors need consideration.

Thus, one may use solid white-painted wall surfaces, one very wide portable screen, or three or more smaller roll-up tripod screens placed next to one another, or the new "fast-fold" screens on which a fabric is stretched onto a portable, on-site assembled frame. The latter allows for rear projection. The screen may be absolutely straight, curved slightly, or curved into a semicircle. The latter would be very difficult to accomplish in a portable arrangement.

All of these would easily accommodate aspect ratios up to 4.5:1.

How will the screen configurations affect the production decisions? If an extreme aspect ratio of more than 4.5:1 is used on an in-line screen configuration one can assume that much of what will be offered on the side areas will be observed only peripherally. Unless emphatic visual cues are used, the side areas are best left to convey incidental information or embellishment. If the screen is curved, bringing it closer to the visual

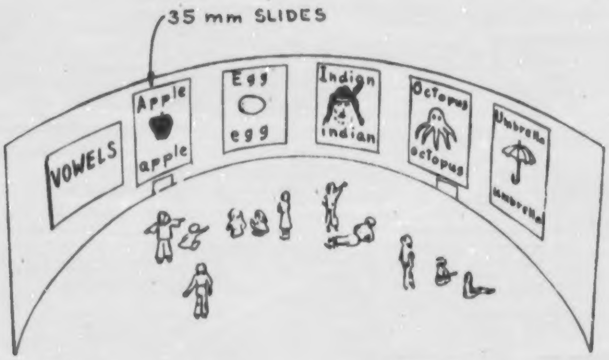


Figure VI-1
A curved semicircle screen in a fixed installation.

Courtesy of Ralph Pandolfi

Picture VI-1
A number of roll-up tripod screens placed next to one another.

AMI Collection

scope of the viewers, more will be noticed. If the aspect ratio is kept to 4.5:1 or less and the screen is far enough from the viewers to stay within their critical visual span – which for most is supposedly around 75 degrees – then essential informative material may be presented on any part of the screen.

Motion picture producers, who pay very careful attention to the physiology and psychology of visual perception, prefer to restrict themselves to aspect ratios of 2.5:1 or less – there may be a lesson in that for multi-image producers to consider. This aspect ratio is already exceeded by a format of two horizontal slides side-by-side, whereas a configuration of three vertical slides projected side-by-side provides an aspect ratio of 3:1.5 or 2:1. Both of these fall easily within the visual field of a viewer.

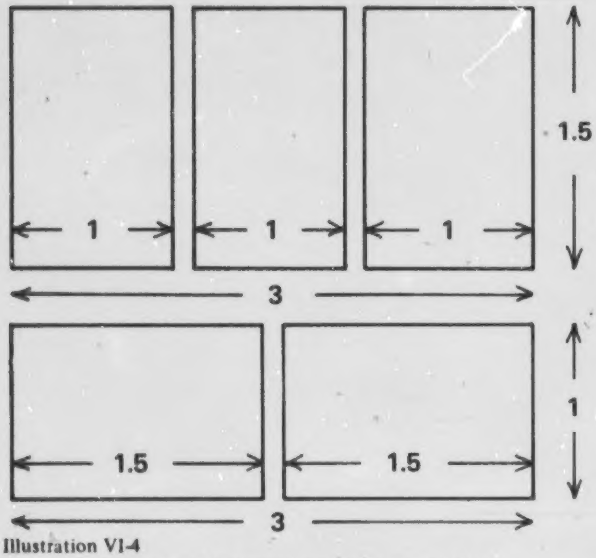


Illustration VI-4
Aspect ratios of two horizontal and three vertical slides.

The Number of Possible Simultaneous Images.
"Orienting three images"

Since most multi-image producers are enamored of the three side-by-side image format let us consider it first. However, it is not the only usable configuration and neither are two images, side-by-side, the only alternative. To allow for flexibility, most producers do not like to constrain themselves to only one or the other image orientation, although very effective programs have been designed with the all-vertical (4.5:1 aspect ratio) or the all-horizontal (2:1 aspect ratio) restriction self-imposed by the producer as shown in examples A and B.

Mixing image orientation calls for screens with a 3:1 aspect ratio and poses an additional problem for the producer. And that is, how to deal with the voids around the images. Most producers simply ignore the challenge, resulting in the uneven spacing seen in Illustration VI-6, others have dealt with it in interesting ways. Notice that with the closely positioned configurations A and B preceding, the aspect ratios of the two screens differed and they were *not* suitable for mixing image orientation, whereas the 3:1 aspect ratio accommodates a mixture of orientations. What this shows us in effect is that each screen has on it three *square* potential image areas of 1:1 aspect ratio into which the images may be projected. By using specially designed offset mounts, the lateral spaces may be reduced as shown in example G, or eliminated as shown in H, and by introducing a trimmed-down "super slide" (mounted in a 34mm square slide mount aperture) the spaces between images could be made to seem to disappear totally as seen in examples I and J. This makes it possible

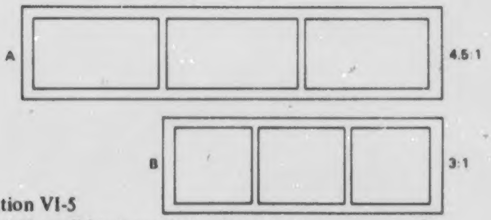


Illustration VI-5
All vertical or all horizontal visual restrictions

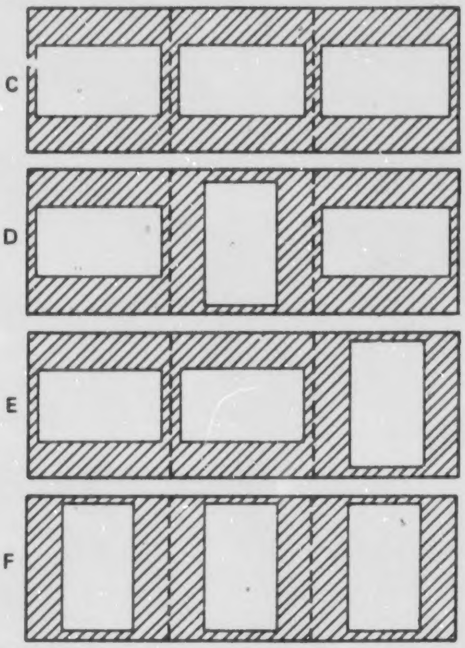


Illustration VI-6
Mixing image orientation

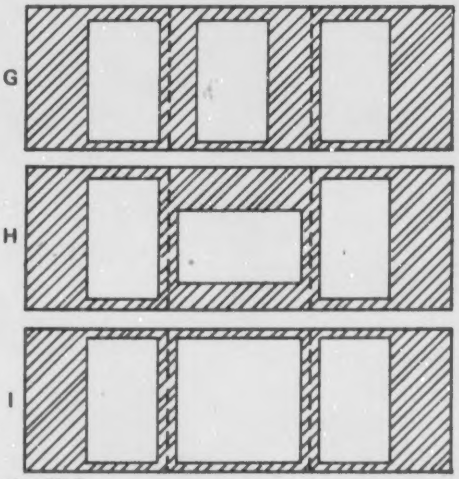


Illustration VI-7
Using specially designed offset mounts

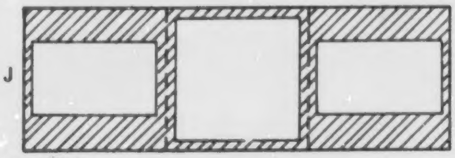


Illustration VI-8
Using specially designed offset mounts

to obtain three-image panoramic presentations on a 3:1 screen without being constrained to the horizontal orientation.

"Composing"

Within the constraints of the 3:1 screen and the three side-by-side potential image areas one can use the orientation with spaces to deliberately organize the visual content. Thus, in example E preceding, one would take advantage of the formal similarity of the two horizontal images on the left to use them for similar content and use the vertical image to carry a contrasting concept. Arrangement D would be suitable for focusing attention on the central vertical using the sides to buttress the central concept. The three widely spaced verticals shown in F serve well to offer three independent or conflicting concepts whereas the three closely spaced horizontals of arrangement C serve ideally for the segmented three-image panorama or for three very intimately indentifiable visuals. The use of the superslide format is handy for emphasis as it will tend to overpower adjacent smaller visuals or to construct a more "compact" three segment panorama of 2-1/3:1 aspect ratio instead of the sweeping 4½:1 ratio panorama of example C.

In preparing the visuals one must take into consideration both their relationship to each other on the screen as well as their sequencing. Color-code the graphics so they do not become dull or repetitious, so that contrasts result not only from conceptual contrast, but from color contrast. Pictorial slides that blend or are juxtaposed should be photographed in the same tonality and illumination. Sharply discordant slides should be separated spatially and temporally so that the photographic differences do not suggest unwarranted (and unintended) conceptual distinctions. Or conversely, introduce deliberate visual differences to reinforce conceptual distinctions.

Also, it makes sense to utilize the slide orientation to emphasize the subject orientation: upright objects are best projected in vertical slides. When considering composition of the forms and suggested motion in the visuals, always think in terms of all the slides projected simultaneously and what precedes and follows in sequence. The progression of the eye should be smooth across all the slides unless a deliberate disruption serves an intended purpose. The typical western viewer has been conditioned to examine a visual field from left to right, the way we read. Incorporate that movement tendency in your slide-to-slide visual composition. When people are shown consider their orientation: a person looking in a direction is probably looking *at* something, it helps to provide that point of focus. Similarly, movement that is depicted should be allowed a direction in which to progress.

"Overlaps"

Multiple projector slide shows make animation possible. Once six or more projectors are involved, quite complex animation becomes feasible. In such instances one can consider more complex overlaps of images than simply allowing one bank of projectors to do straight sequential dissolves. Thus, extremely interesting effects can be obtained by using masks and overlapping images to allow the superimposition of many more than two or three images on one screen area. A simple potential sequence is shown in Illustration VI-9 in which an aspect ratio of 2.25:1 is obtained by overlapping the left and right halves of two conventional 1.5:1 projected fields. With three projectors allocated to each field, the center can animate with six projectors in sequence. Innumerable effects can be obtained, in addition to the few suggested. However, the chief advantage here is that the central, focal area, can be covered by six projectors which can all be flashed on in very rapid sequence without need to wait for the slower cycling time of the Carousel projector.

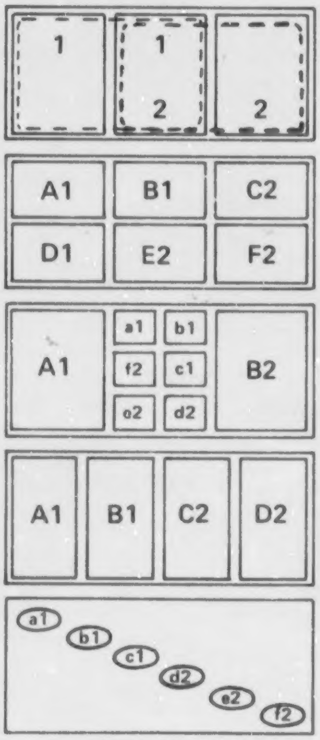


Illustration VI-9
Overlaps

Designing visuals for such a configuration requires a high level of skill and creativity, precisely cut custom masks, and the use of pin registered cameras, copy boards, and mounts to keep everything in continuous alignment.

"Complex matrices"

The preceding example brings up the possibility of placing the visuals in arrangements other than side by side. Slides can be projected in matrices such as a two by two grid, a three by three grid, a two by three, or other configurations as shown in Illustration VI-10.

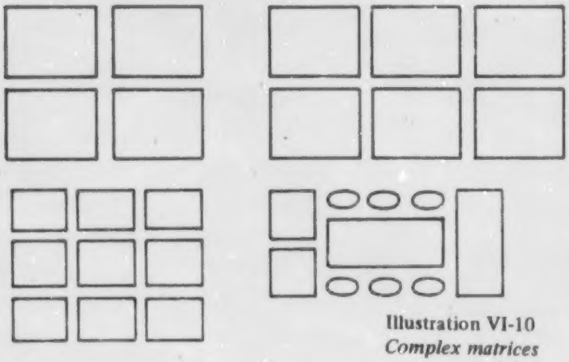


Illustration VI-10
Complex matrices

It is quite likely that the reason that complex matrices have been avoided by multi-image producers is their complexity and not because the simple side-by-side triptych is inherently superior for conveying information or emotional impact. Insofar as stacked matrices tend to use rather small aspect ratios, approximating the 1.5:1 of the single slide, they lack the wide screen's initial impact. However, by allowing for far more "action" and the introduction of two dimensional rather than only one-dimensional relationships between images, far more intricate concepts can be illustrated.

Furthermore, it is not necessary to allocate two projectors for every image area. By judiciously using the overlap principle just mentioned, ten projectors could very nicely cover a three by three matrix. Illustration VI-11 also suggests the use of projectors with differing focal lengths in one show. Thus, two projectors could be allocated to cover the entire screen – both to project large single images, no matter what their aspect ratio, as well as to provide the background ongoing coverage, the visual equivalent of musical "continuo," or the "drone" of a bagpipe or sitar. In the illustration, precise registration has been deliberately avoided to make it possible to show the overlap. Such an arrangement allocates two dissolving projectors to each image area and permits a far more complex matrix than the three by three "basic" grid. Also, the center cell can be animated with the full complement of ten projectors.

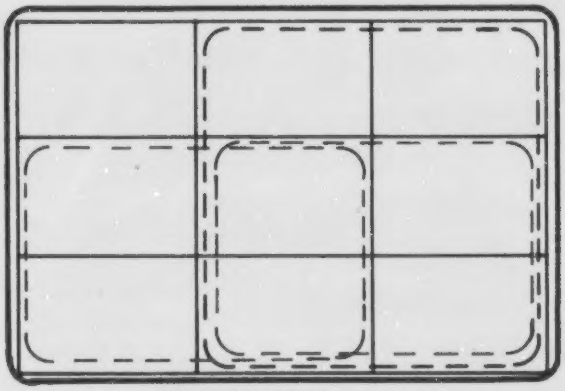


Illustration VI-11
Using projectors with differing focal lengths

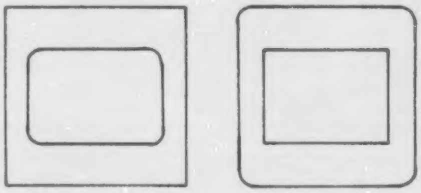
Masks and Mounts

Masks and mounts are of little concern to producers who restrict themselves to full-frame slides projected side by side. If the dissolves used require precise registration, then pin registration mounts would be useful, masks would serve only to help opaque out unwanted areas.

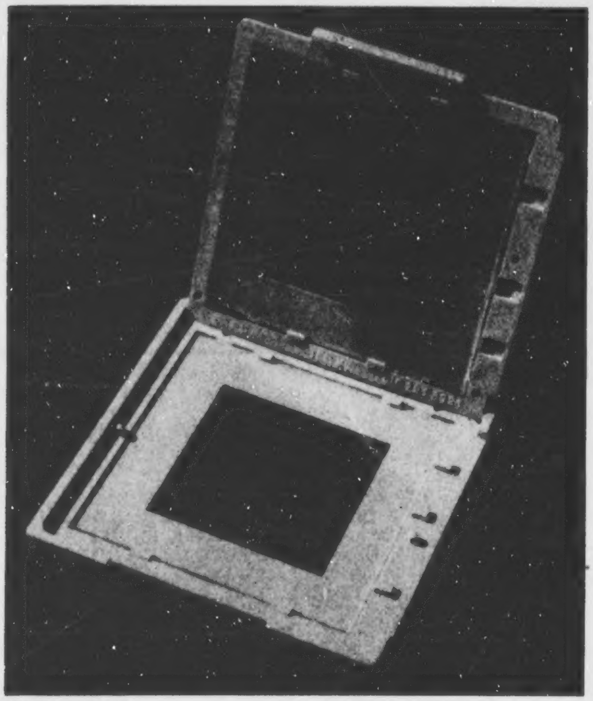
The Choice of Mounts

Broadly speaking, there are three classes of mounts: a) cardboard, b) plastic, and c) glass enclosed. The cardboard mount is the one provided by most color film processors. It is cheap, relatively easy to use – although it requires a heater to seal the slide (ready-made heat sealing presses can be purchased or one can use a clothes iron). The cardboard mount holds the film securely in place and it is both light in weight and thin, making it easy to use in a 140 slide tray. On the other hand, it bends and frays easily, the film can come unsealed in the mount, and the natural roughness of cardboard combined with its light weight makes it more likely to jam than others. There is only a limited choice of formats for cardboard mounts as regards the dimensions of the interior opening or whether the inner or outer corners are sharp or rounded. The typical cardboard mount has opening dimensions of 34mm by 23mm.

Illustration VI-12
Choice of mounts



Plastic mounts come in a wide variety. The least expensive ones cost only slightly more than cardboard mounts. Most do not require heat to enclose the film, and the less expensive ones do not hold the film securely fixed in the mount allowing it to shift slightly. They are easy to use, will not bend, are readily available with rounded or angular corners, assure a smooth movement in and out of the projector, and are available in several weights and thicknesses with the thinner ones working well in 140 slide trays.



Picture VI-2
A commercial plastic slide mount.
Photo courtesy of Wess Plastic

The heavier and more expensive plastic mounts offer internal registration "pins" (actually little square protrusions, onto which the film's sprocket holes may be pushed to precisely locate the piece of film in the mount). Also, mounts of this category do offer a variety of custom apertures that in effect provide masking for each slide.

Glass-enclosed slide mounts offer the widest variety of features. They are available in conjunction with either plastic frames, metal frames, or combined plastic-metal arrangements. They are not cheap. They are substantially heavier than the aforementioned mounts and consequently move with ease in slide advancing mechanisms. As a rule, they cannot be used in 140 slide trays, and many of them are quite heavy, making transportation of large numbers of glass mounted slides cumbersome and expensive.

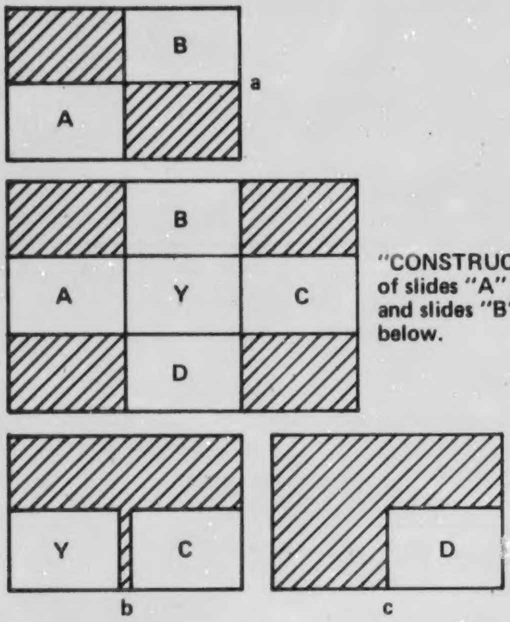
The glass surfaces of these mounts press the film flat, and thus keep it from "popping" when the film heats up. Thus they also make uniform field focusing much easier. The present-day glass surfaces are so coated as to minimize the appearance of diffraction patterns – known as "Newton's" rings – and are frequently labeled as "anti-Newton" mounts. The glass obviously serves to protect the film surface as well as keeping it flat, but introduces the problem of the vulnerability of the glass itself. The glass mounts provide locating clips to keep the film positioned as inserted. However, deliberate shifting of the film piece in the mount is not easy. The more expensive glass mounts also incorporate registration pins as well as a great variety of precisely fixed masks – usually made of thin metal, making for very accurate apertures. Similarly, there are glass mounts in which the apertures (or openings) are molded in the plastic frame itself.

It is helpful to know beforehand, when taking the photos, how the slides will be mounted and whether they will be pin registered or not, so that one can plan for exact positioning. Informative sheets and pamphlets are available from custom mount manufacturers detailing the mount and aperture dimensions. For major, well funded productions, it is even possible to order custom-made mounts to suit any need.

Masks and What They Offer

The use of masks has been discussed throughout the preceding sections. Masks serve to either simply "mask out" unwanted content, to change the aspect ratio of portions of individual full-frame images, or to impose novel outlines on images – such as circles, ovals, diamonds and others. The more important use for masks is to make it possible to use one single slide to project multiple images and to position image segments in specific subregions of the image field. Thus, masks are essential to producing programs using extensive overlapping and for animation effects in which different areas of a field are projected in a rapid sequence.

One suggested use for masks is to create matrix effects without extensive rephotography. A readily available mask, such as the one in Illustration VI-13, may be used to hold two cut-down film pieces in a mount so as to in effect project two distinct images, A and B, with one slide. When used in conjunction with a three by three "matrix" as suggested before, single slides with various masks can in effect produce the matrix with a few slides. The combination that the producer would select would depend upon the sequence preceding and to follow, it would depend on what is to be left constant and what is to change.



"CONSTRUCTED" of slides "A" (above) and slides "B" & "C" below.

Illustration VI-13
Slide masks

Producing a visual script for something like this can be difficult – but if creatively handled, the results can not only be spectacular but also provide a level of design control otherwise not possible. When photographing slides for such a production, extensive preplanning is needed if one is to avoid rephotography of all slides to reduce them to fit the apertures. This can be avoided by inserting the mask over the camera's focusing screen (possible only with single lens reflex cameras with readily exchangeable focusing screens) and centering the material in the intended locations.

Masks can be avoided altogether by rephotographing each subsidiary slide on a backlighted animation copy board. At some expense, such sophisticated rephotography service is offered by several slide production and duplication companies.

Masks are available in at least five possible forms. The most primitive do-it-yourself approach is using an opaque tape or coating applied to the film to outline the desired areas. Care should be exercised to assure that the material is truly opaque and that it does not "bleed" when heated up in the projector. Aluminized mylar tape offers a sharp, clean edge and when applied to both sides of the film is satisfactorily opaque.

Another do-it-yourself mask results from photographing the desired masking pattern with high contrast black and white film and sandwiching the resulting mask in the mount. The other three alternatives are to use commercially available products. These may be: a) opaque, pre-cut mylar tape masks that one can apply to the film, b) thin metal cut-out masks prefitted into the slide mounts to which the film is then keyed, using either a retaining clip or registration pins, and c) mounts in which the configuration of the opening itself in the plastic frame constitutes the mask. All are probably equally serviceable, although the cost varies. Literature on masks is available from the same manufacturers that produce professional mounts.

"Going beyond 35mm film"

It is not essential to restrict oneself to 35mm film to make 35mm slides. When designing complex, large-scale matrices it may be desirable to cut up a large transparency, say a 4 by 5 view camera transparency, into several 35mm slides that abut precisely, either for panoramic effects or to create a jig-saw puzzle assembly effect. This is possible if one purchases a special cutting jig that accurately cuts sheet film into the 35mm format while punching in the sprocket holes to enable accurate registration in the mount's registration pins.

Rephotography

Making slides by photographing existing visuals on a copy stand involves more than just making the exposures. One needs to locate, or more frequently make up, the materials to be rephotographed; one needs to prepare the material for the exposure, and one has to decide on the types of films and effects desired. Let us start by looking at making up the subject material.

Making Graphics

Graphics, as used in multi-image presentations, range as widely as they would in illustrating text. However, since the pace of multi-image shows tends to be fast, they should be simple, easy to grasp, using minimal text, and amenable to color coding. Under graphics one could identify three broad categories: a) linear pictorial illustrations, be these detailed black and white line drawings, simple stick figures, cartoons, or diversionary patterns used to terminate or break up a sequence; b) tabular material such as charts, tables, maps, or flow-charts; and c) text, be it one emphatic word or a few paragraphs.

"Illustrations"

Unless the work of a competent graphic artist, pictures rendered by the producer should be as simple as possible. A certain degree of simplistic crudeness in drawings is frequently acceptable if they are not elaborate. It helps to work big, to use extremely opaque inks, and paper on which the lines will not run or "bleed." Also, the use of various transfer-type artists aids simplifies the task. Humorous cartooning should be left up to those who are skilled at the art. All work to be reproduced with high contrast copy film should be so executed as to avoid any continuous tone gradations.

"Tabular material"

Any charts and tables that are used from existing sources should be so masked as to exclude any extraneous material. Charts drawn specifically for the presentation are best done using various graphic art materials such as line and pattern tapes. Drawing or inking good looking, densely black lines requires great skill, special smooth paper, and appropriate pens and inks. Lines drawn with a pencil or nylon point pen seldom appear acceptably uniform when blown up on the large screen. On the other hand, straight lines of variable widths can be easily made using "chartists" tapes which are available both in solid colors (black) as well as in varying patterns. Text and numerals should be done as discussed in the following section.

"Text"

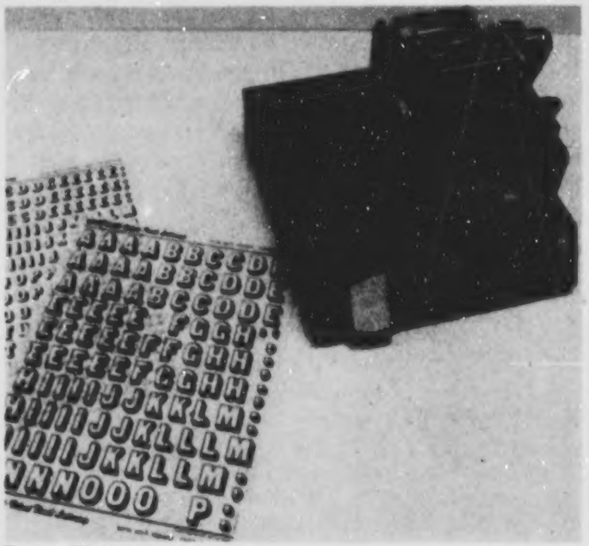
Standard typewritten letters and numerals, when enlarged extensively, look extremely "frayed" and uneven. Consequently, it is well worth the expense to have text typeset. There are presently available numerous relatively inexpensive, so-called "cold type" devices, many of which are available in walk-in, printing service facilities. Insofar as one seldom needs right and left justified text, all that is required is that a series of words and sentences be typeset on a sheet of smooth, chalk paper.

Since such service costs by the hour, one should first handletter the text, with appropriate spaces between and above and below each word group, using capitals and lower case where desired, and then give the operator specific instructions. It helps to use the largest type style available – to keep from having to do extreme microphotography – and to pick one style for its legibility and attractiveness. A sheet of typeset words is likely to cost little more than a few sheets of rub-on artist's aid letters and save one a great deal of time.

Firms that specialize in typesetting usually work for various publishing enterprises. Consequently most of them should be able to coat the back side of the typeset sheet of paper with adhesive wax. Waxed paper is far easier to position and fix to a layout than doing the same with rubber cement or other adhesives. However, care must be exercised to keep the surfaces clean.

Once armed with the sheet of waxed, typeset text one simply cuts out the words and phrases, positions them in the proper art work – or constructs the artwork around the text – and they are ready for rephotography.

The only meaningful alternative is the use of rub-on artist's aid letters. These are available in a great variety of type styles and are easy enough to transfer if not too many words need to be made up. One must pay attention to spacing, to maintaining alignment, and to assuring that all parts of each character have transferred before lifting the sheet. Mistakes can be corrected by scraping but corrections are seldom satisfactory – doing the art over again can be time consuming. One also does well to assure oneself of the freshness of each sheet before starting; old, dried-out letters tend to transfer only partially, causing problems with constant need for corrections.



Picture VI-3

Sheets of commercial transfer letters and a lettering device.

Photo courtesy: Duane Troxel

Layout

Just as when working with animation techniques, it helps to do the work in premeasured and pre-ruled "cells." For full-frame rephotography, cells can simply be rectangles with a 1.5:1 aspect ratio ruled in "drop out" or light blue on good quality blank index cards. Ready made cell cards may be purchased from slide mount and mask distributors.

It is suggested that one standardize on a limited number of cell sizes – three or four may be appropriate. A reason for varying the cell sizes is that a visual with one short word logically requires a larger type size than one encompassing a phrase. Instead of using larger type, one can simply photographically enlarge a smaller cell. To minimize changes in copy stand settings it helps to standardize on a limited set of "scales," rather than vary the size continuously.

The layout of each cell itself should be so composed as to consider the layout of adjacent cells – indeed, it helps to keep the "artwork" for several simultaneous visuals together. If some of these are already taken pictorial slides, a rough outline sketch of each slide should be kept on hand for reference.

During the layout phase one also does the preparations for animation. This is usually best handled through the use of multiple overlay sheets, which can be of transparent acetate stock or paper, thin enough to be translucent over a light table, thereby allowing keying the consecutive visuals to a master visual.

"Creating panoramas"

Multi-screen panoramic photos can be taken directly in nature (a procedure discussed in the final section) or they may be "artificially created" from existing prints, photos, or even slides. Producing second-generation panoramas is easily accomplished using prints or photos. However, since the degree of enlargement has to be at least three-fold, one should verify first that the orginal's grain structure is fine enough not to become offensive under extreme enlargement. A full three-field panorama calls for isolating the section to be used and then measuring out a rectangle with a 4.5:1 aspect ratio on a firmly attached more-or-less transparent overlay sheet. The actual dimensions are computed by basing a ratio on the critical dimension which may be either the height or width. Thus a 7.5 inch wide area requires a height of 7.5/4.5 inches, i.e., one needs a 1-2/3 inch high rectangle 7.5 inches wide. This long rectangle is itself divided laterally into three equal 1-2/3 inch by 2½ inch adjacent rectangles on the overlay.

To rephotograph the panorama, sequentially align each rectangle in the camera's viewfinder, lift back the overlay and make the exposure, then align the camera with the next area on the overlay and repeat the procedure.

Using the Copystand

A copystand may vary in sophistication from an inexpensive single-lens-reflex camera mounted with a home-made plate to the focusing rack of the head lifting mechanism of an enlarger from which the enlarging head itself has been unbolted (not possible with all enlargers) to a full fledged animation stand equipped with a rotating, indexable copy carrier and a top quality camera modified so as to assure repetitive pin registration for each frame. Although equipment dealers also advertise rigid copy stands equipped with instamatic cameras, this is definitely not suitable for the multi-image producer. Between these extremes exist a wide variety of quality and cost combinations.

A through-the-lens reflex camera is essential. It helps to select a camera in which the viewfinder exactly covers the entire field. Frequently the film will capture more than the viewfinder shows and then the producer may have to mask out extraneous material. Also, a close-up, or so-called

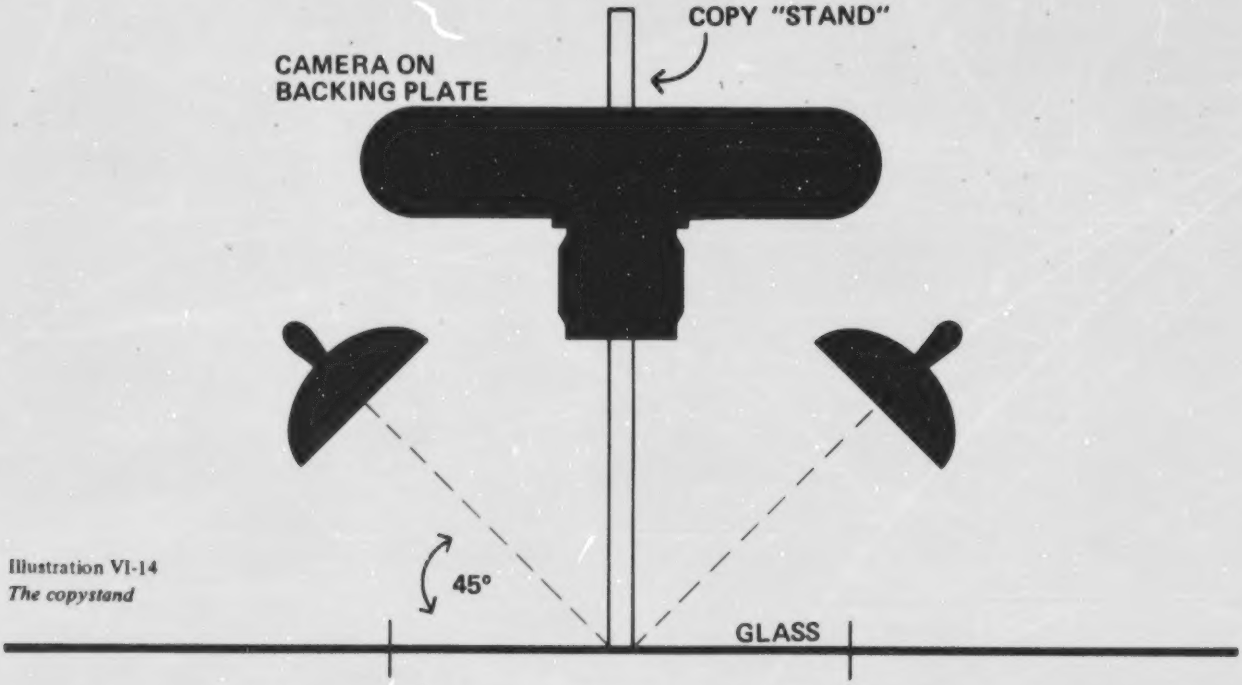
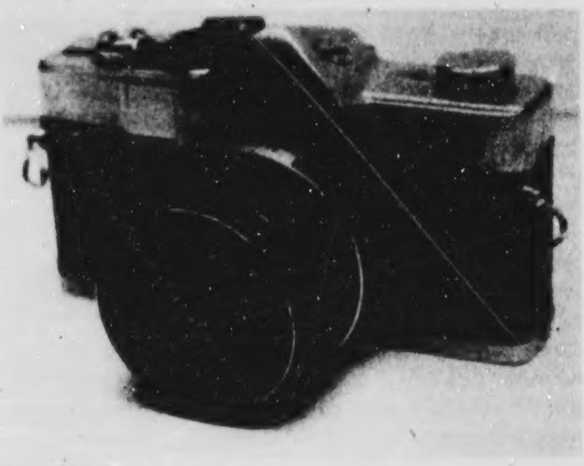


Illustration VI-14
The copystand

"macro lens" is to be preferred, the longer focal length lenses interfere less with illumination in extreme close-ups, but require a longer travel on the raising mechanism for large artwork. For extreme enlargements a set of "extension tubes" is needed – fully coupled tubes make work easier.



Picture VI-4
A single lens reflex camera.
Photo courtesy: Duane Troxel

Illumination should be bright enough to permit making short exposures. The lights are best aligned at 45 degree angles to the artwork and should be equipped with lamps that are rated at a color temperature compatible with the color film being used. If the film and illumination do not match, a color correction filter must be used – this, however, reduces the incoming light and calls for longer exposures. Photoflood lamps generate a great deal of heat, consequently working at the stand may become quite uncomfortable and the artwork may overheat and curl up unless one constantly turns the lamps on and off and flattens down the artwork with a sheet of heavy and optically more-or-less flat, plate glass. To eliminate picking up reflections, the light from the two lamps may be passed through sheets of polarizing material and the lens equipped with a polarizing filter. This again decreases the light entering the camera and lengthens exposure time.

Films for Rephotography

Since rephotography is usually done using incandescent, or tungsten filament lamps, it is sensible to use "indoor" rather than "daylight" films. Rephotography could be done outdoors in sunlight, or indoors using daylight film with color correction filters, but these approaches are worth considering only in "emergencies." Rephotography always introduces image quality deterioration; hence, it is sensible to use the finest-grain/highest-resolution films to minimize degradation. However, fine grain films are usually slow in "speed" and consequently the producer wishing to rely on fast exposures (possibly to minimize the effects of copy stand vibration on long exposures) may have to compromise.

The other film suitable for extensive copystand use is the high contrast copy film – such as Kodalith Ortho Film, Type 3. That film has an extremely slow film speed – indeed the ASA rating is not published by Kodak. If one also uses extension tubes, which affect exposure differently depending on their length, it is best to start by exposing a test roll at various magnifications and for varying artwork. Carefully maintained records will soon make accurate exposure estimation easy.

The resulting high contrast white-on-black slides can be toned with sandwiched color transparency overlays, with chartist's colored transparent tape (available in many widths), and by applying dyes on the film – these could be food dyes or inks from various acetate coloring felt or nylon-tipped pens.

The choice as to whether to process the films oneself, depends not only on skill and equipment available but on scheduling pressures, prevailing wages of the personnel involved and previous experience regarding quality and reliability in meeting schedules.

Photographic Basics

It would be pointless to include instruction on the "how to" of photography in this book. There are too many excellent ones available already and those who are novices would do well to study them. However, there are some unique aspects to doing photography for multi-image presentations and these require some explanation.

Maintaining Tonality

To a great extent the multi-image producer's task is far more similar to a cinematographer's than to the ordinary still photographer's. Since the temporal sequencing is as important in multi-image as in cinema one needs to preserve continuity where it is intended. Sequential photographs under sunny, then overcast, and then morning lit, illumination will tend to clash. Changing films and processors mid-stream can lead to the same problem although it may not be as noticeable as changes in weather and time-of-day.

One way to assure continuity is to do what the filmmakers do: use artificial light to override the natural illumination. The only way to do so economically may be with judicious use of strobe flash fill-in. That, however, is only applicable for near-foreground illumination and useless for landscape or cityscape photography. In those instances one simply tries to standardize picture taking to specific conditions, allows for these abrupt changes in the narrative scripting, or isolates very different visuals by interspersing content that breaks the continuity.

Using Vertical Orientation

Many producers like to standardize on the horizontally oriented slide and shun mixed presentations as discussed in the section on "orienting three images." Knowing this in advance helps to assure adherence to the chosen format when photographing "situations of opportunity" with the possible intent of using the images later on. If one is photographing "on assignment," as it were, it behooves one to have the storyboarded script along for constant reference. Again, it helps to cultivate the thinking patterns of a cinematographer rather than of a single image photographer who only occasionally thinks in terms of "series." In a pinch, vertical slides can be cropped to the square 23mm format or rephotographed to yield a horizontal, enlarged copy.

Photographing Panoramas

Photographing a three image panorama in nature is more problematic than simply pointing the camera at three consecutive fields of view.

For one, the panorama offers the viewer an intense awareness of the horizon – hence all three exposures must adhere to the true horizontal. Level the flat pan head platform of your tripod first with a bubble level, secure the tripod solidly, and then allow only lateral rotation for the camera, once mounted. This assures following the horizon. Try to avoid extreme wide-angle lenses, even a 28mm lens tends to photograph the world as shown in Illustration VI-15 with the result that any existing or imagined parallel lines above or below the horizon will fail to line up. Furthermore, three wide-angle images projected onto a non-curved screen offer an extremely unrealistic view of the world. (The 28mm lens covers a picture angle of 74 degrees, hence 3 such images in a row represent a 222 degree wrap around – or "fisheye" – view, not really realistic on a flat screen.)

Indexing the camera as one rotates the camera through the panorama sequence is best done with a precision device such as Nikkor's "AP-2 Panorama Head" which provides precision indexing points for lenses of varying focal lengths. Lacking such a device, one should select, and commit to memory, convenient distant markers and orient these at the juncture points. Avoiding close-in, or detailed subject matter at the break points will help minimize any visible discontinuities. When photographing panoramas, one must also keep in mind whether the three images will be projected with small dark spaces between them on the screen and whether the viewfinder shows the entire image area or leaves some out. Both factors will affect the resulting match between slides.

Whenever photographing three screen panoramas with rapidly moving subject matter – such as crowds, a freeway, or a stormy ocean, it is not sufficient to use exposures fast enough to "freeze" the movement in each slide. The movement can make it hard to match the three slides. In such instances one must align three identical cameras over a common crossing point, as shown in Illustration VI-16, and make all three exposures simultaneously using three cable releases triggered at the same time.

It is worth noting that, strictly speaking, the three image panorama is not a multi-image entity but a very large single image. As such it clashes with the rest of the presentation – usually to good effect. However, it should be used with discretion and only where appropriate. A dozen panoramic displays in a ten minute program seems too many, unless showing panoramas is central to the theme.

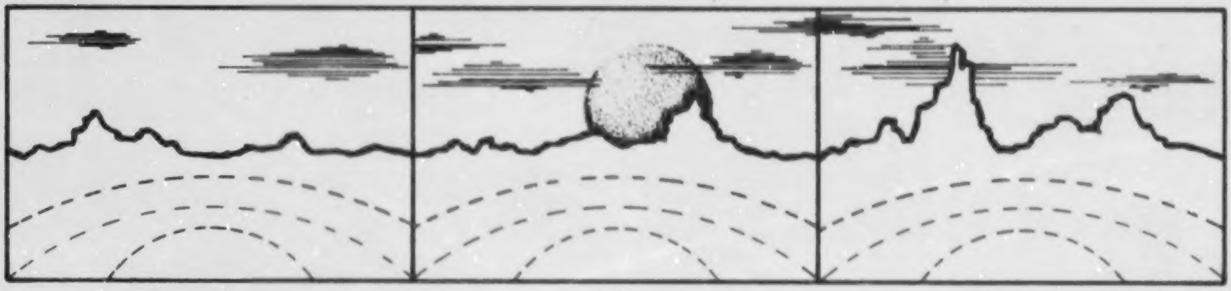


Illustration VI-15
Photographing panoramas

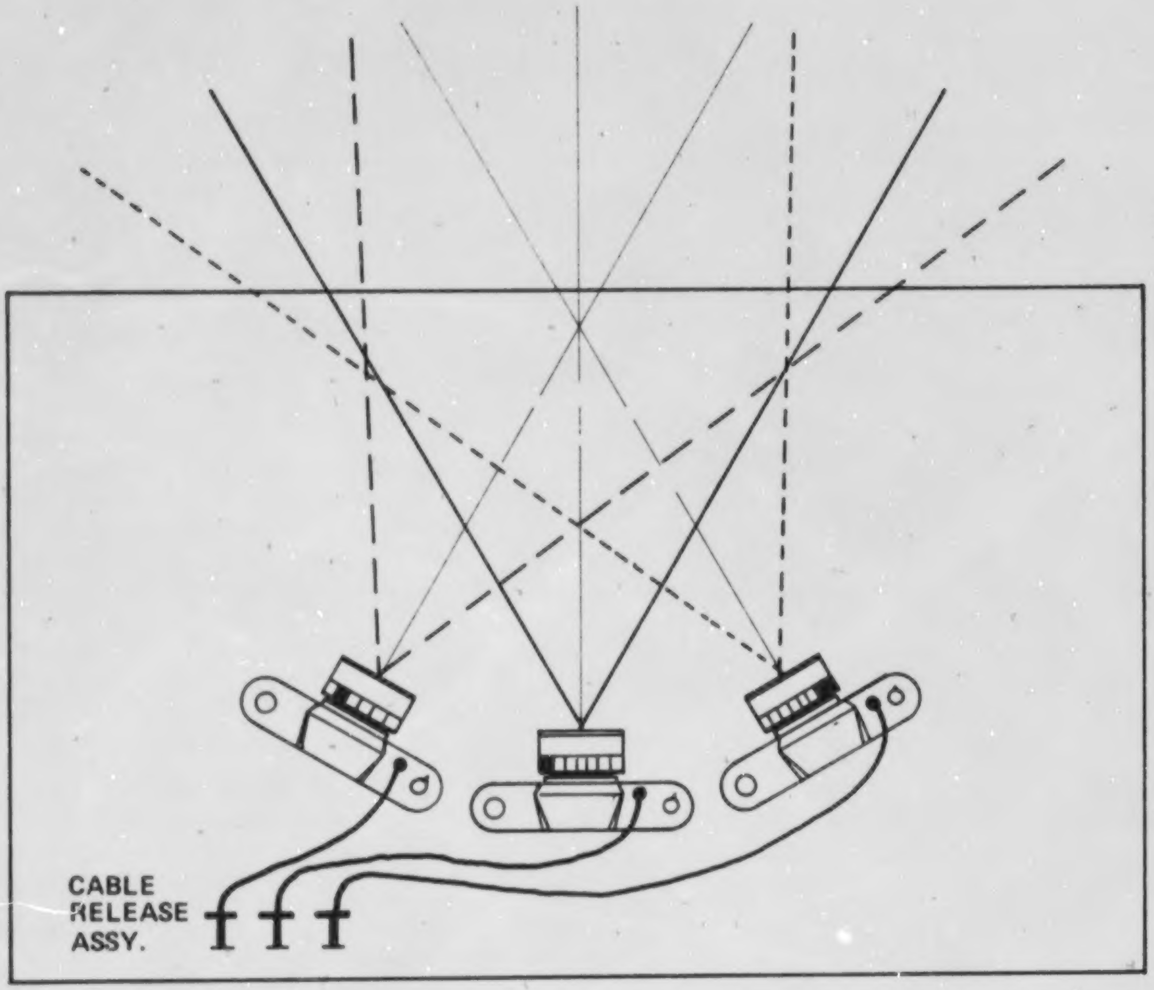


Illustration VI-16
Aligning three identical cameras over a common crossing point.

Model Releases

Unless you are working only for the pleasure of it and do not intend to publicly exhibit or somehow profit from your work, you should obtain model releases from every distinctly figured person in your slides – anyone who could be recognized and is not in the midst of becoming a "newsworthy" personage, i.e., is minding their own business. Photographing such individuals can constitute invasion of privacy and the signed release will help minimize future confrontations. You need *not* obtain the release *before* taking your photograph but you should not display it publicly without such a release.

Doing photography on private property or in privately controlled buildings open to the public may also necessitate approval to use the resulting pictures. One can always take a chance, but becoming the subject of a "test case" can cause extreme grief and expense.

As mentioned at the start, it also behooves a producer to constantly refamiliarize himself with the latest interpretations of the copyright law so as to know how to handle available "stock slides," and various visuals that seemingly unavoidably wind up on the copy stand because, "after all" they fit so well . . .

CHAPTERVII
PRODUCING THE AUDIO

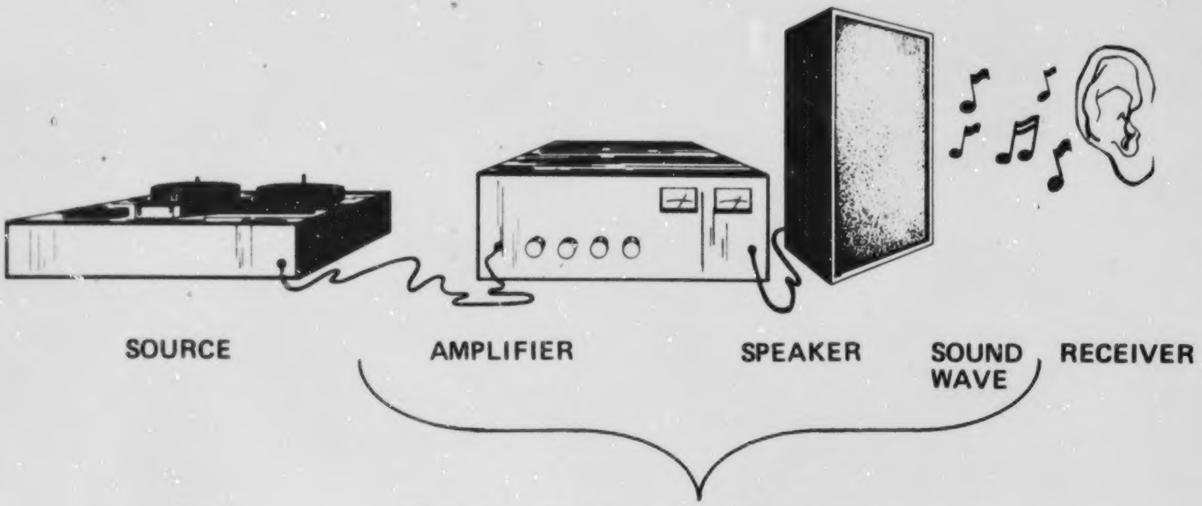
Ken Burke

Introduction

In this chapter we will discuss the audio accompaniment to a multi-image program. No technical expertise is expected of the reader, but those who would prefer more elaboration on various aspects of audio may refer to excellent texts. Technical operations and organization of American radio stations are summarized in Oringel (1972) whereas Nesbitt (1972) offers a more complex look at radio, especially from the viewpoint of BBC radio drama broadcasts. Contemporary music studio recording is treated at length by Runstein (1974), while Alkin (1966) provides a handbook for using audio in television productions. Hopefully these references will provide the type of advanced knowledge sought by readers who have mastered the material in this chapter.

The Nature of Audio

Audio, as we will use the term, refers to the electronically amplified sound recording used with a multi-image program. While it is presumed that such a soundtrack will be recorded on audio or video tape, a phonograph record, or a strip of film, it is conceivable that someone might follow the example of John Cage and expand that possibility by using a live broadcast from a radio or television receiver to accompany the visuals. Another possibility would be using music and/or readings by live performers. Nevertheless, it is most likely that a multi-image program will have its soundtrack on reel-to-reel or cassette audio tape. Thus, the discussions in this chapter will center on recording and editing for the medium of audio tape.



In terms of communication theory, these would all be electronic and acoustic channels carrying the message (signal).

Illustration VII-1
The Audio Process

Physically, audio consists of: a *source* (the recorded signal), an *amplifier* (to increase the volume of the signal, a *speaker* (to transmit the signal into the listener's environment) and a *receiver* (a person with an ear to respond to the signal).

We have defined audio in terms of playback only, since this is what concerns us in using the final soundtrack. This presumes the entire process of recording our audio. We will devote most of this chapter to explaining that recording process.

Sound is measured in terms of its pitch (frequency) and loudness (amplitude). The first is measured in units known as Hertz, or Hz, and the second in decibels or dB. From the standard 0 dB level (which is below the threshold of normal hearing), ordinary conversation is rated at about 60 dB while a jet take-off is rated at 120 dB.

On a tape recorder volume meter, dB are measured as amounts of volume either above or below peak recording efficiency. In Illustration VII-3 the needle shows the amount of volume as being -2 units from the optimum level. As we have seen, a loss of only 2 units from a comfortable level is hardly noticeable. Remember that dB units are simply units of measure and relative ones at that.

The 0 Volume Unit (VU) mark on your tape recorder is another standard against which you measure increases and decreases of volume. More information on using the volume meter is provided in the section on tape recorders.

As regards the other primary measure of the soundwave, its frequency is measured as Hertz (Hz), and it indicates the pitch of the sound. The higher the Hz number, the higher the pitch of the sound. Each instrument has a limited range of frequencies it can produce, going from a low of 50 Hz for the bass drum to a high of 16,000 Hz for the oboe. Human voices range from 100 to 8,000 Hz for males and from 150 to 10,000 Hz for females.

We need to know about frequency ranges in audio recording when choosing equipment that must be able to reproduce the range of sound to be recorded. If a recorder or microphone is sensitive only to sounds in 500-10,000 Hz range, there will be certain kinds of sounds which will not be recorded. On the other hand, there would be little need for the added expense of a machine that could capture a 30-30,000 Hz range since very few untrained ears could hear the difference. Choose equipment that will serve your recording needs.

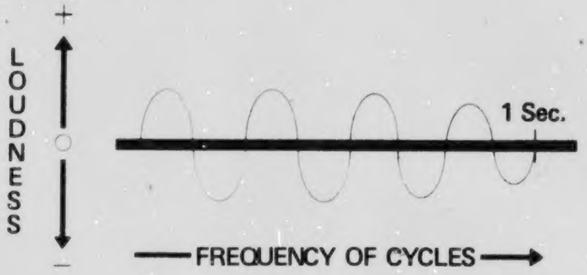
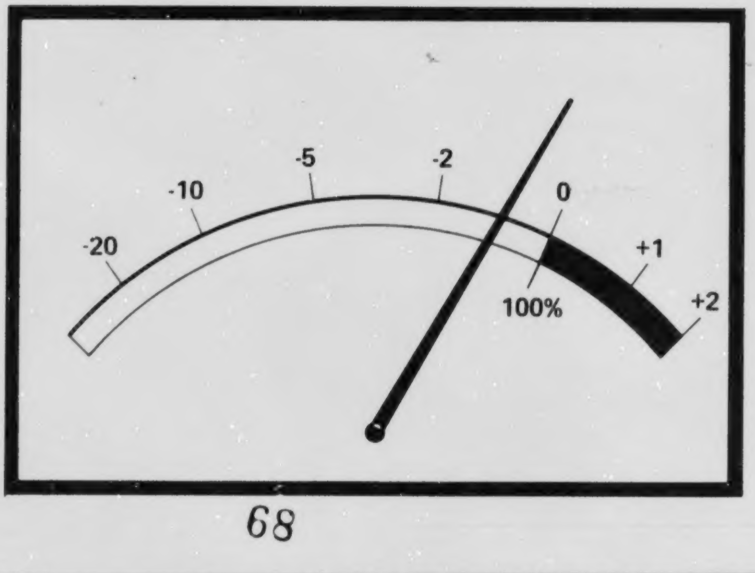


Illustration VII-2
The Soundwave



The Volume Meter, which measures decibles as Volume Units, is more commonly known as "VU Meter".

Illustration VII-3
The Volume Meter

For simple transcribing of speech a range of 200-5,000 Hz is adequate. Studio equipment should be better.

Use of Audio in Multi-Image Programs

We will normally find multi-image program soundtracks on audio tape, but we might on occasion use sound motion picture film as well. Film sound can be either optically or magnetically recorded.

Once we understand these differences the average multi-image producer can do little with film soundtracks except ignore them or play them. If a soundtrack must be taken from a file, make every attempt to run it through a tape amplifier system rather than directly through the detachable projector speaker. Film projector speakers do not compete with tape speakers, because so much is lost when trying to mix the two. By following the pointers later in this chapter, it should be simple to run film or video sound into an audio tape speaker system. You may also ignore the film sound by turning it off and substitute another audio recorded on tape. Often this gives the producer greater control over timing and content clarity.

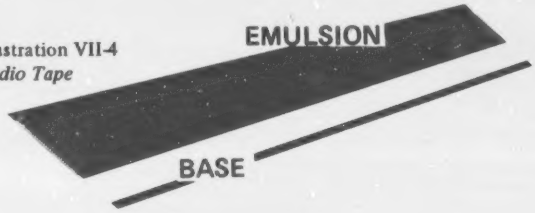
Our first recommendation in producing the soundtrack for multi-image programs is to use an audiotape recording and playback system. Audiotape is high in quality, yet affordable. The signal may be recorded in various ways on audiotape; these can be grouped as follows: (1) *simple recordings* from one source onto the tape; this includes both direct narration or music recorded through a microphone and copying (*dubbing*) a signal from a prerecorded tape or record; (2) *voice-over* (VO) *narration* where the primary message is embellished with background music or sound effects (SFX); this can be accomplished on a stereo recorder without using a mixer; (3) *edited tape* where changes are made in the original recording by splicing the tape; and (4) *mixed tape* which uses an electronic mixer and additional sound equipment. Mixes can be simple transitions between two sources, sophisticated ways of providing VOs, or complex means of building up layers of voices, music, and SFX.

Physical Characteristics of Audio Components

Audiotape

Audiotape consists of an *emulsion* of powdered metallic oxide (or rust) mixed into a *base* of some sort, analagous to the emulsion of photographic film. This is where the signal will be recorded. Quality of tape recordings depends on the quality of the emulsion. These emulsions vary but iron, or ferric oxide, has been the most popular for years. This rusty-red or rusty-brown tape is still the most readily available recording tape. Improved mixtures have been released in recent years. Of these, chromium dioxide (Cr0^2) emulsions seem to offer a marked improvement over standard tapes. There is also "low noise" tape, which is simply a better manufactured version of ferric oxide. Choice of tape depends on the importance of the subject and the budget of the producer; "low noise" is generally more expensive per reel than standard tape and Cr0^2 costs even more, but tape costs seldom account for a large part of production costs.

Illustration VII-4
Audio Tape



Tape base is now almost exclusively polyester plastic, but older magnetic tapes were backed with acetate. Acetate is very good for editing because it cuts smoothly and easily. Unfortunately it also breaks easily and is subject to sticking to itself when stored in warm conditions. Polyester stores well and has been greatly improved in its editing capacity; however, it does have the disadvantage of stretching under tension. It is much more durable in ordinary recording use than acetate, but when pulled tightly it will go wire-thin before breaking. Broken tape can be repaired, but stretched tape is good only for odd sound effects.

A related aspect of tape base is thickness, measured in thousandths of an inch (mils). To counteract the polyester's tendency to stretch, it is best to use the thickest tape available – 1.5 mils. Tape thickness also determines how much tape is on a reel. Since reels come in standard sizes (10", 7", 5" and 3"), different lengths of tape can be put on the same size reel, depending on how thick the tape is. The thinner the tape, the more you can get on a reel. Thin tape has a greater possibility of "print through," where the recorded signal "bleeds" to other adjacent layers of the tape as it is wound tightly onto the takeup reel thus causing extraneous sounds on the recording. For multi-image programs nothing thinner than 1 mil tape should be used.

Tape running times are usually printed on box lids in which tape is sold and is directly related to how much tape is on the reel and how fast the recorder is transporting it. Recording quality is best at faster speeds, so some basic rules are 1) always use 1 or 1.5 mil tape, 2) always record at least at 3¾ ips or preferably 7½ ips, and 3) use only one "side" of the tape so that you can edit later by cutting the tape.

Recording occurs as the metallic particles of the tape are magnetized by the incoming electronic signal. The more the particles are magnetized, the better will be the quality of the recording.

Another factor that affects tape quality are the number and widths of the tape tracks. As shown in Illustration VII-5, standard ¼" audiotape and cassette tape may be divided into several formats. This is accomplished by the configurations of various recording heads. With more tracks there are less particles available per track. Thus, the complexity allowed by multi-tracking—sacrifices some recording quality and must be compensated for by using higher speeds.

In summary, tape recording quality is affected by: (1) composition and quality of the emulsion, (2) recording speeds, and (3) width and number of tape tracks. A fourth factor is the size of the gap in the recording head.

As shown by Illustration VII-5, there are several ways in which a signal may be recorded onto a length of ¼" audiotape. The important fact is that you never record on the "backside" of the tape, but rather on tracks that were not magnetized on one pass of the tape across the record head. The symbols next to the tape tracks in Illustration VII-5 refer to tape recording heads. Note that the gap in the white part of each head is all that actually functions during recording, so that in some configurations it is possible for tracks to pass over the head without recording a signal. When the tape is turned over, the recording head is then in position to record on those "empty" tracks.

As noted, the wider the track, the fewer tracks per tape, and the better will be the quality of the recording. This is why audio studios use full and half track decks. (Some recording studios may use 16, 24 or more tracks, but they compensate by using wider tape, often up to 2 inches wide.) For the producer of educational multi-image programs, track stereo should be adequate. Quadraphonic sound would provide even more versatility but

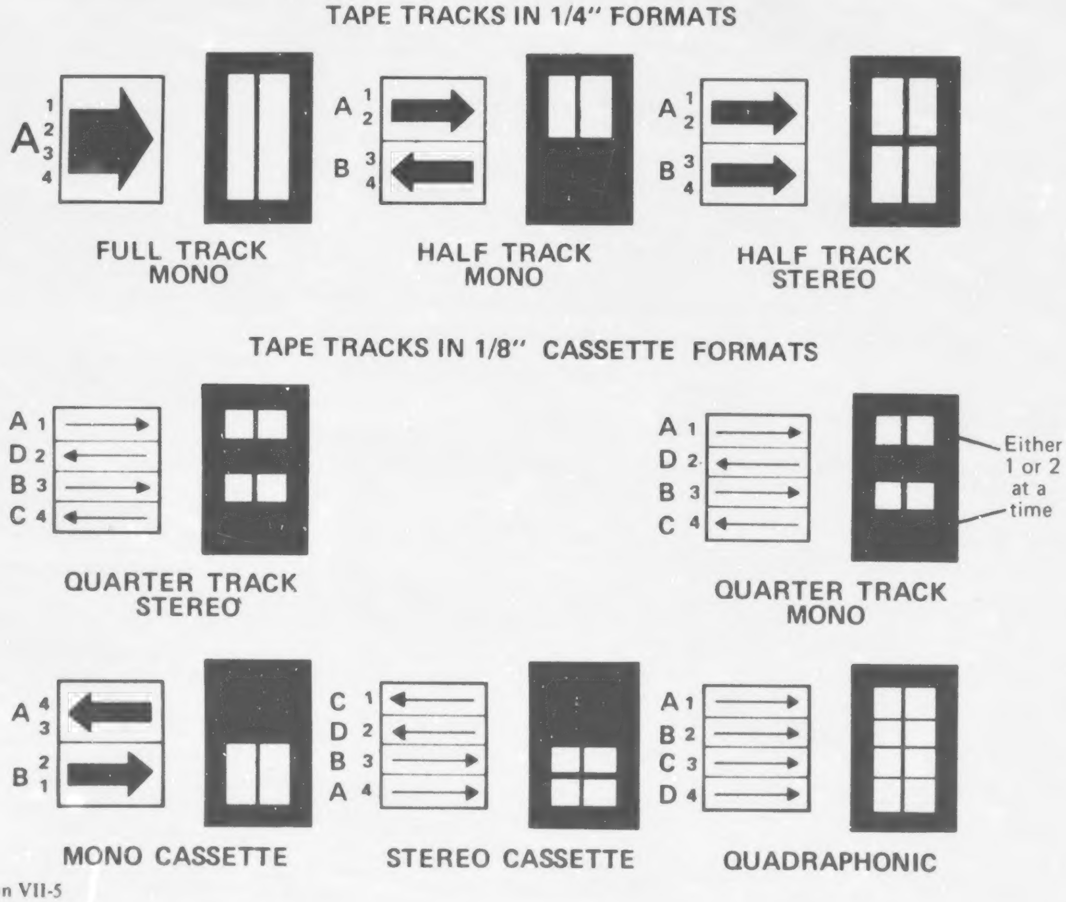


Illustration VII-5
Tape Track Formats

requires more playback gear if all channels are to be used for soundtrack material. A last reminder is that any reel or cassette tape can be used on any reel or cassette recorder; special track configurations do not necessitate special tapes. However, chromium dioxide tapes do require recorders whose electronics have been designed for them if their full advantages are to be utilized.

Tape Recorders

Now that we have covered the nature of tape, we will discuss tape recorders. Illustration VII-6 shows the two basic tape recorder systems: the *transport* system reels and the *electronic* system. All these elements are shared by most stereo tape decks. One main transport difference with 8-track cartridge tapes is that the tape is all on one reel that continuously moves the tape in a circle across the heads.

The key part of all transport systems is the tiny rotating cylinder known as the *capstan*. When tape is pressed against it by the large rubber *pinch roller*, the capstan pulls the tape across the heads at a constant rate. When loading reel tape be sure to thread it between the capstan and the pinch roller. Also noteworthy is the small wire cut-off switch to the left of the heads (on most tape decks). Failure to pass the tape over this switch results in the recording remaining turned off. All these devices are automatically engaged with cassettes and cartridges.

Tape recorder electronic systems are focused on the *heads*. Sophisticated recorders use a separate

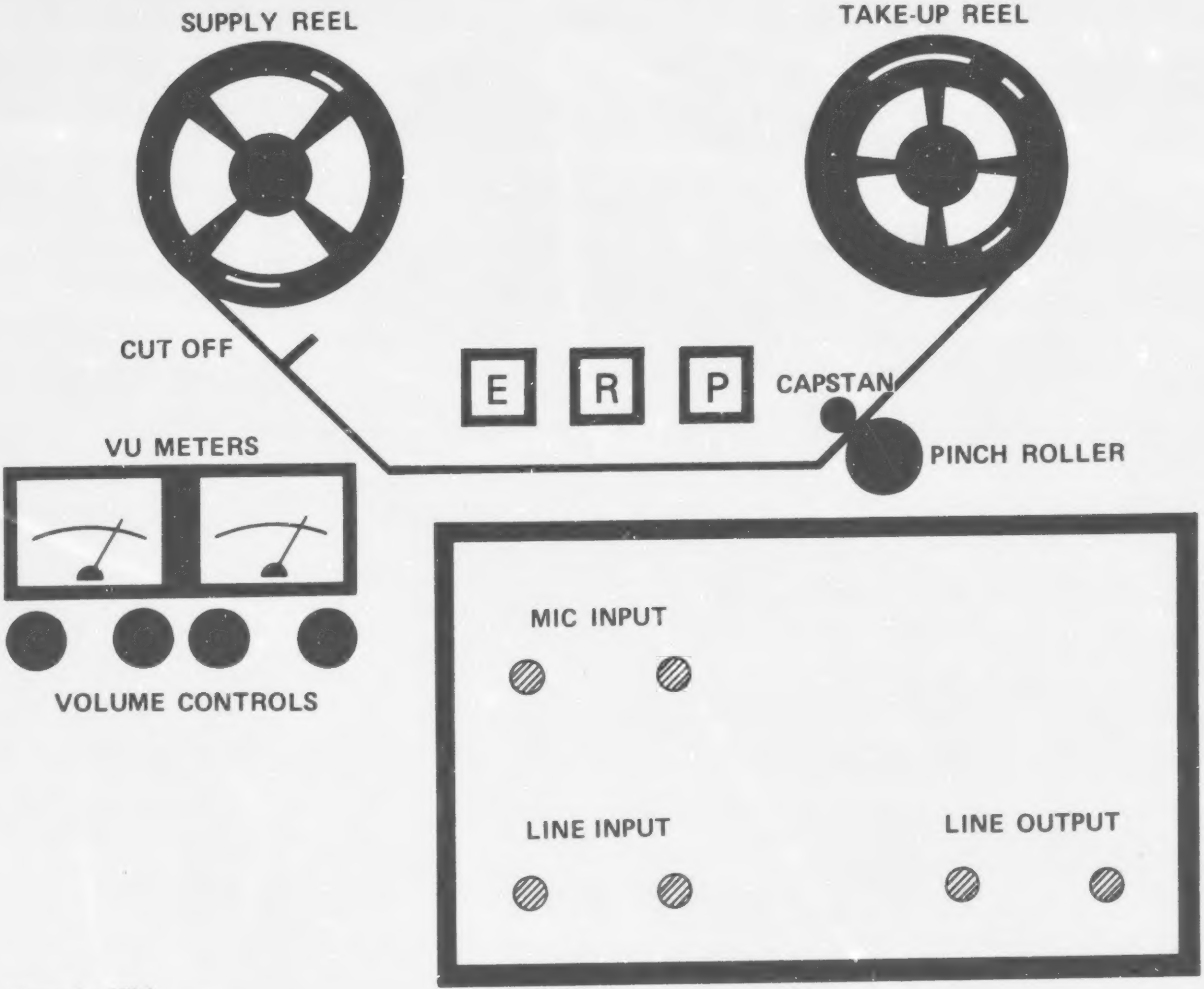
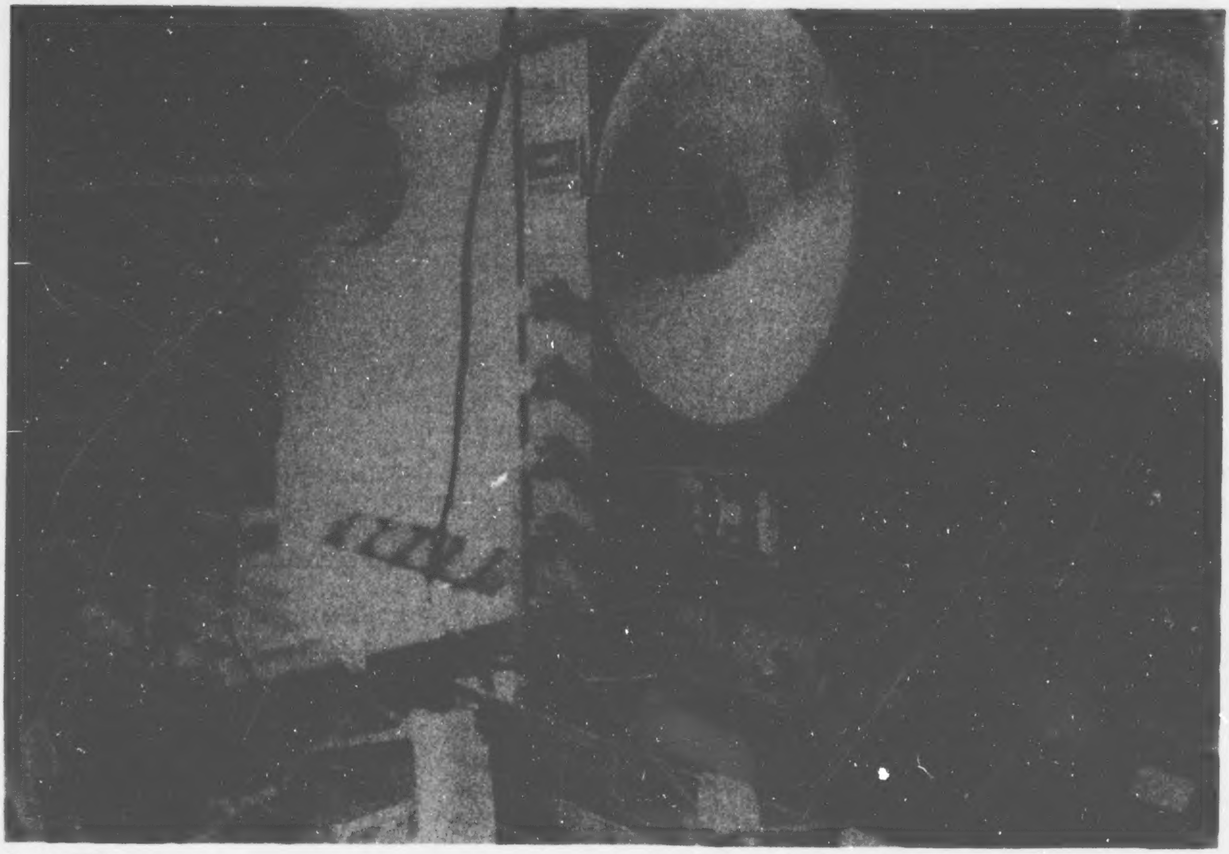


Illustration VII-6
The Tape Recorder



Picture VII-1
A stereo tape deck.

AMI Collection

head for record and playback; less expensive ones combine these functions in one head with a resultant loss in quality. In the record mode, tape is automatically passed over the erase head which is activated in the appropriate track so as to demagnetize existing signals before new ones are put on. In the playback mode the tape also passes across the erase and record heads, but they are not activated. In the fast forward and rewind modes the tape is lifted away from the heads before being rapidly transported.

Recording occurs at the tiny gap in the head where the magnetic fluctuations contact the tape. The smaller the gap the better the varying magnetic field is focused and the better will be the final recording. The playback head reverses the process and translates magnetic fields into electronic signals which are amplified and carried to the speaker where it is transformed back into acoustic energy or soundwaves.

A recorder's heads should be periodically demagnetized and cleaned. Demagnetizing is accomplished with a demagnetizer. Its "business end" is passed close to the heads, but should *never* touch the heads. Cleaning can be done with cotton swabs and either special fluids or various forms of alcohol.

Another important component of the tape recorder are the VU meters that show the amplitude of the recorded material. Recordings should always be monitored with earphones, but reference to the meter settings will help in obtaining the proper level. Record close to 100% VU capacity with only occasional bursts into the red overload area. Recording too loud causes signal distortion, but recording too low will result in emphasizing unwanted machine and tape noise (hiss) during playback. For soundtracks it is best to monitor the entire tape, making periodic adjustments if necessary. Automatic level controls, (ALCs), should not be switched in or used because these adjust all incoming sounds, no matter how loud or soft, to one level. Crescendos are softened and quiet moments (with accompanying tape hiss) are unnaturally boosted. Practice manually adjusting record levels ("riding gain") so that you can do it smoothly during recording if you have to. Simple duplicating (dubbing) does not require riding gain, though; just set your level during the first several minutes so that it will not *peak* (bounce into distortion) too often and let it go. Commercial materials have a range of volume, as does all natural sound, so do not expect to always operate at the 100% setting. For many kinds of sounds a 60%-80% setting is ideal.

Normally, reel-to-reel recorders are the best format because they offer far greater flexibility in editing. It helps to also have quality cassette decks (preferably the portable kind equipped with a Dolby circuit) on hand, but where budgets restrict, it seems that reel-to-reel recorders offer the greatest flexibility except for portability.

Turntables

Since much of the musical source material that one uses will come from records the producer should have available a quality record turntable that will produce good, clear sound.

Picture VII-2
A quality record turntable. Photo courtesy: Duane Troxel

One problem that the multi-image producer must learn to overcome when using material from records is that disk sound is a pre-arranged product that cannot be altered until after it has been transferred to tape. Only a few turntables provide a precise way of "cueing" the records so that a sound can start at the instant that it is needed, so that this starting/stopping may have to be done with intermediate tape recordings. Records offer a wealth of lyrics, music and SFX; nevertheless, they tend to be too clumsy to use as complete soundtracks and should only be used as sources in dubbing or mixing material onto tape.

Microphones

Essentially, microphones (as mikes) are transducers – devices that transform one form of energy into another. Microphones accomplish this by re-using one of several kinds of vibration; the major types are listed in Figure VII-1.

Another important characteristic of microphones is their *polar recording pattern*, which is the angle of acceptance for incoming sounds. Omnidirectional mikes take in sound almost equally from all sides, *bidirectionals* have two "dead" sides, and *unidirectionals* (*cardioids* – from the heart-shaped polar pattern) have one end which is more "live" or receptive. Not all cardioid mikes are equally "unidirectional," so that if high directionality is desired, be sure to study the polar pattern of several alternative mikes before picking one you want. Practice is necessary to learn proper mike placement for giving a sense of reality to the recorded sound, yet becoming familiar with each

Figure VII-1
Characteristics of Microphones

Type of Mike	Element Vibrated	Durability	Polar Recording Pattern	Normal Impedance
crystal, carbon, ceramic	salt crystals, carbon granules, ceramic plate	fragile	omnidirectional	high
ribbon	aluminum ribbon between poles of magnet	fragile	bidirectional	high
condenser	air pressure generates, a current from a separate usually built-in pre-amp power supply	may be fragile (although newer ones tend to be quite rugged)	cardioid or omni	low, but often adjustable internally
dynamic	diaphragm	rugged	cardioid or omni	high or low

For reasons of cost, reliability and durability, we would recommend either *dynamic* or *condenser* microphones for most recording purposes.

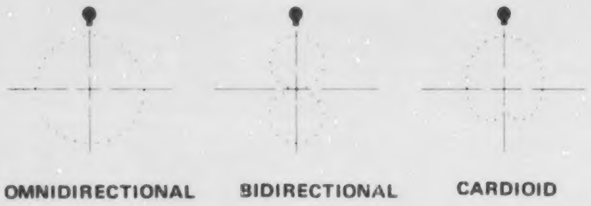
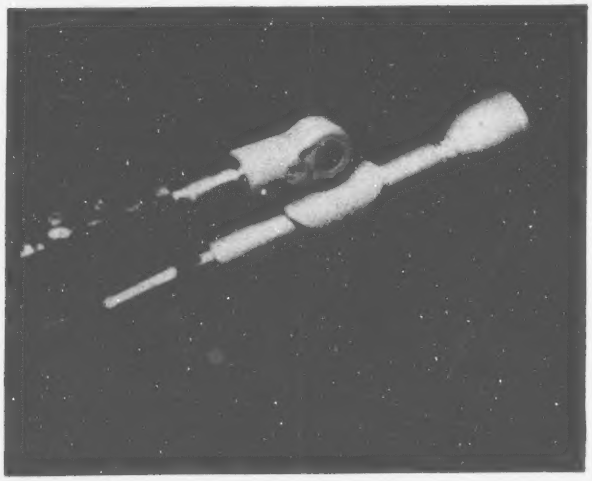


Illustration VII-7
Polar Patterns of Microphones

mike's polar patterns is the first step in properly recording a situation. A cardioid mike would be used for a narrator or singer or to allow a minimum of "location sound" to mix with the dialogue. An omnidirectional would be best for a group engaged in interviews, background vocals or constantly shifting action. When taping outdoors, be sure to use *windscreens* (porous shields which block most of the "roar" caused by the wind) and *shotguns* (super-cardioid mikes that accept only a narrow angle of sound, even over distances and can be pointed at the sound source).

You should also be sure that each microphone's *impedance* will match the published impedance range of the recorder's input. You must also match impedances between components or you will suffer a serious loss of performance. A low impedance mike sends so much current into a high impedance tape recorder input that the signal becomes distorted. Similarly, a high impedance recorder played through a low impedance amplifier provides it with too weak a signal; as volume is boosted, inherent electronic noise is also boosted. When checking for impedance match, you can assume that most consumer-type equipment has high impedance inputs.



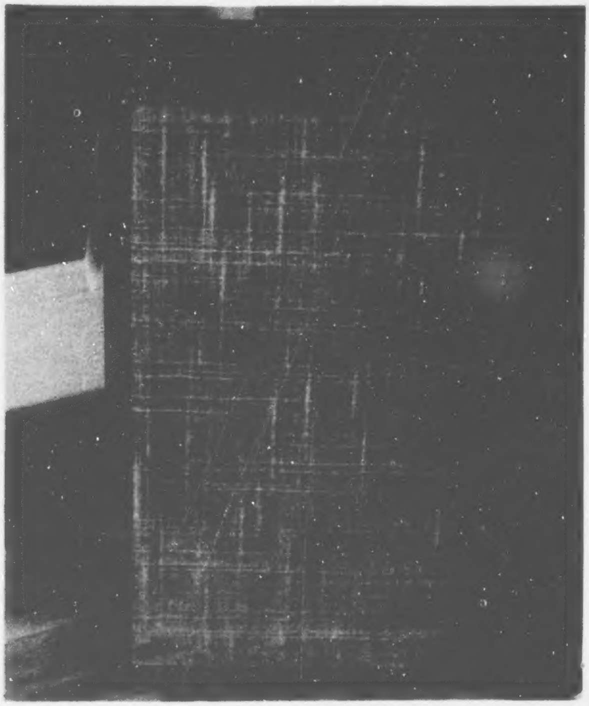
Picture VII-3
An Omnidirectional Microphone.
Photo courtesy: Duane Troxel

Amplifiers and Speakers

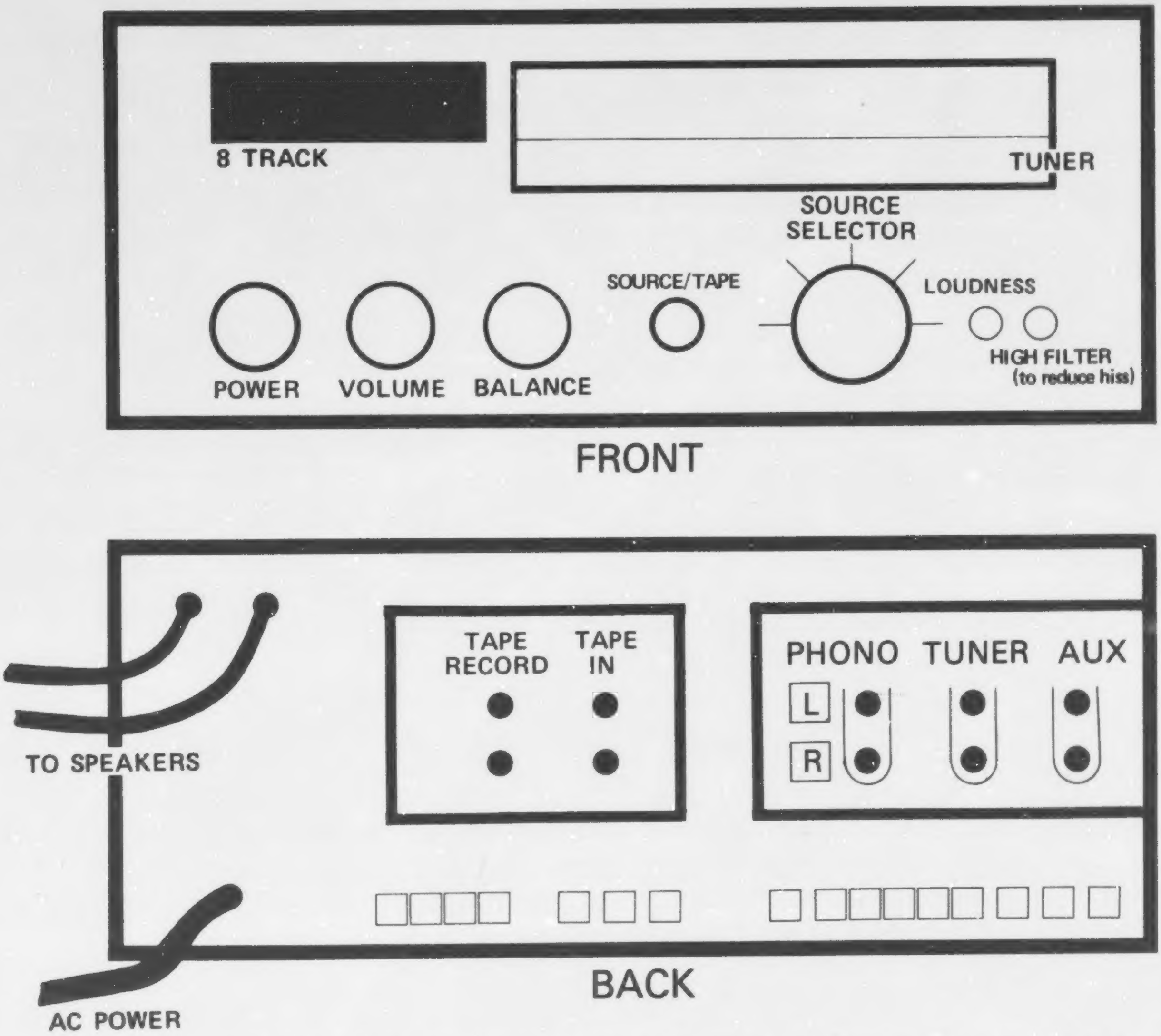
While the electronics and design of amplifiers and speakers can be quite complex, their function is simple: to increase the level of the signal or volume to an acceptable hearing level, then translate that signal back into acoustic soundwaves. In loud speakers the electronic signal vibrates a movable coil attached to a cone which then moves the air, thereby producing an audible sound. Sophisticated speakers may use other vibrating elements to give maximum clarity to the sound.

Modern consumer-type amplifiers offer very sophisticated controls that can allow the audio recording operator extensive opportunities to regulate, alter, and move the signal back and forth without having to connect and disconnect cables. When choosing among available units, ask the sales representative to demonstrate various available equalization and tape dubbing features, as well as look for the greatest variety of built-in input and output terminals.

If you are lucky, your speaker inputs will have plugs at both ends of the cable; if not, you will have cables with wires that must be attached to screws. This will be either one wire or a pair for positive and negative grounding, as in Illustration VII-9. These double wires will be color coded; keep your wiring consistent to avoid playback distortion.



Picture VII-4
A typical loudspeaker.
Photo courtesy: Duane Troxel



These inputs will not be on amplifiers with built-in sources, such as the one shown in the front view.

Illustration VII-8
The Amplifier

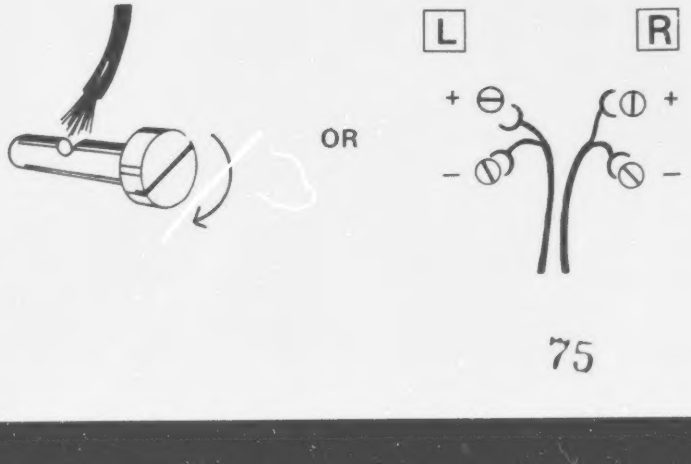


Illustration VII-9
Speaker Cable Connections

At this point we should clarify the process of connecting, or "patching," components together. Illustration VII-10 shows the major types of cable *plugs*. Cannon Connectors are normally used for low impedance use and come with an additional grounding element built into the table. One quarter inch *Phone* plugs are also often used with low impedance gear, while RCA type or *phono* plugs and *mini* plugs tend to be used for high impedance. Adapters are available that will convert one format to any other.

Illustration VII-11 shows how a Cannon mike cable can be adapted into a mini-recording input. Impedance is also adapted at the Cannon-phone stage.

The much used "male" and "female" terminology is analagous to biological structure, and the input terminals for plugs are also known as *jacks*. At the amplifier there will be input and output jacks, with corresponding input and output jacks at the other components. Thus, a standard set of stereo patchcords is a pair of cables terminated in phono or RCA plugs that carry the signal from one machine to the next. Patchcords come in varied lengths and can be extended through proper adapters up to about 20 feet without any serious deterioration in signal quality. Note that the recorders have two sets of input jacks, one for "MIC" and one for "LINE." The line input is for an amplifier source – usually its high impedance "tape" output.

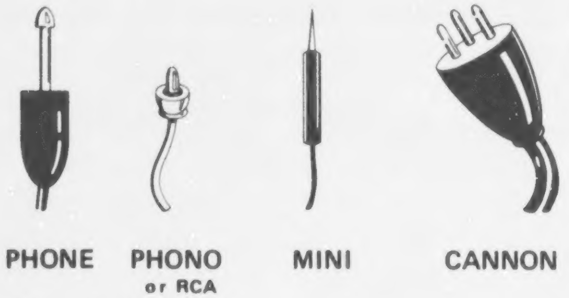


Illustration VII-10
Plugs

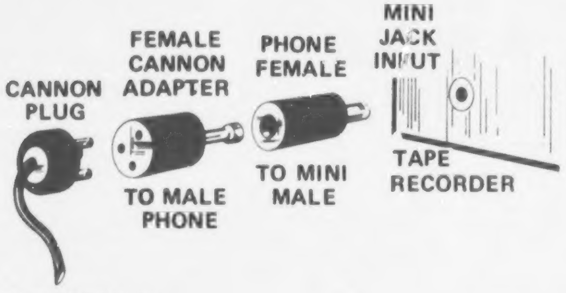


Illustration VII-11
Cable Adapters

Mixers

Patching leads directly into a discussion of mixers, since mixing is essentially the patching of several sources together before sending them to a master recorder.

Mixers come in two varieties, "active" and "passive." Active mixers have built in preamplifiers and cost several times more than the passive kind. Passive mixers do all on one to mix signals but one can only "mix down" – i.e., the signal coming out will be reduced and must be reamplified by the next electronic device in line. Passive mixers are not suitable for mixing signals from sources whose level outputs differ greatly.

Some mixers take only phone inputs; others provide phone inputs for low impedance mikes as well (impedance adapters are built into the mixer). Most mixers allow input volume to be controlled through a *fader* which slides vertically from 0 to maximum sound. If the fader is a round knob it is known as a *pot* (for potentiometer). Stereo mixers give you a separate fader for each channel of each input; you must then set volume levels for balance between all inputs and for the total output. Normally there will be a VU meter and a master volume control on most active mixers to help you accomplish this. To insure a good balance, monitor the process with headphones as well.

Two other common features on mixers are *attenuators* and *panpots*. The first is a switch below each fader; it allows you to cut the volume of loud inputs by some level, say 20%. This should not be used unless it is necessary because you do not want to boost the input volume any more than you have to in achieving a 100% VU meter setting. Any time you boost any type of volume you increase the amount of electronic noise which will then be included on the recording. Panpots allow you to spread a single channel source, such as microphone narration, over both stereo channels. This is often done with a *distribution switch* that sends the left signal to the right channel also, or vice versa. Mixers with such an input position are very helpful in giving more fullness or directionality to microphone recording. A final note is that this input position does not affect the rest of the mixer. Thus, you can keep background music in its original stereo separation while sending mono narration to both channels.

Other Modulating Equipment

More detailed texts should be consulted for explanations of such devices as echo generators, compressor expanders, Dolby noise reduction systems, and equalizers. All of these can be used to enhance sound quality or to add unique effects. Briefly, we can say that *equalizers* and *filters* work by changing the frequency emphasis within the sound (they are complex tone controls) while *compressor/expanders* – change the volume "envelope" of the entire sequence of sound and act as complex automatic level controls). Compressors also work as *limiters*, cutting off any volume program on beyond the 100% VU level so as to prevent distortion.

Recording Techniques

Since many other handbooks stress the "how to" of recording, we have stressed the nature and operation of audio equipment. However, we will offer the following suggestions to aid you in the recording process.

Miking

1. If possible, choose a polar pattern that best suits the recording situation.
2. Normally, the mouths of narrators or singers should be about 6 inches from the mike for maximum recording efficiency.
3. Speak "across" the mike, with it about 45° to the mouth, to help reduce popping sounds.
4. Isolate the speaker in a studio or sound-insulated room. If none is available, cover a room with carpet and cardboard egg containers or isolate the speaker with some type of portable panels (*baffles*).
5. Do not mount lavalier mikes (small ones designed to be worn around the neck) on a stand away from the speaker. These are designed to cut off bass frequencies – which are emphasized by the chest cavity – and they will produce an unnatural, tinny sound when moved away from the body of the narrator.
6. Always use a very sturdy mike stand, but do not put it on surfaces that will be vibrated by those present. Finger tapping on a table or foot stomping on a stage will be picked up as noises. Use a boom stand or hang the mike from above.
7. Do not expect perfection from your narrator. If a mistake is made, repeat and identify the next attempt ("take two") and the content ("page 4, third paragraph, sixth line") for later ease in editing. This is much easier than constantly starting over or re-recording.
8. Turn off playback speakers while recording through a mike, or a sound loop will occur that causes a screeching *feedback* noise.

Dubbing

1. Patch as directly as possible between components because adapters and extra distances can cut down on quality. Tape recorders have adequate *pre-amps* to allow patching directly from one to another. Mikes can also go directly into recorders. Turntables must first go through an amplifier.

Plan ahead to accommodate any problems.

2. Most tape recorders have a "pause" control that allows you to halt the recording process without disengaging the record mechanism. Thus, you can start in the pause made before you hit "record" and then patch in your input signal. This allows you to set proper recording volume and begin taping at the right time without wasting tape. When doing in-deck edits during a recording session, use the pause control and manually back off the tape each time you restart (a 1/8th of an inch will do) to minimize starting noises.
3. This way you can tape your segments tightly together, thus eliminating "dead air" tape and reducing your past-session editing needs.

Editing

1. Electronic editing is done by combining sources in real recording time through a mixer. If you choose to work this way, trial runs and a stopwatch are mandatory.
2. Physical editing is done by cutting the tape and splicing the ends back together. For best results use a metal splicing block and a razor blade. Locate the place to cut, mark it with a white China marker, cut it on the block, and put the proper ends together with 7/32" splicing tape.
3. Locate your edit points by listening carefully to the audio segment, engaging the pause control, advancing the tape by hand (rotate both reels to prevent stretching), and listening through headphones to hear the proper tape position. This is relatively easy when the task is to cut out dead air and extraneous noise; it becomes more difficult when the cut must be made at the end of a word or a note of music. Only practice will give you the needed skill, but it is possible to splice around individual syllables once you have mastered the technique. Keeping the heads in contact with the tape while moving the reels by hand is only possible with mechanically controlled (not solenoid actuated) and very expensive tape decks.

4. Since some recorders will not allow you to monitor signals while in the pause position, try removing the tape from between the capstan and the pinch roller, engaging the pause control, and pulling the tape by hand slowly over the heads. If this does not work, you must locate a mechanically controlled tape deck for editing.

5. Always splice plastic leader tape onto the front of your soundtrack. This allows you to "cue up" the beginning of your presentation for a quick, smooth, professional start. If there is more than one soundtrack (*cut*) on your final tape, put about 2 feet of leader tape between each cut. This will enable you to find everything and cue it up quickly. Another organizational trick is to label both reel and box with content, playback speed, running time, and mono/stereo designation.

Simple Voice-Over (Narration with Music)

With a stereo recorder you could "mix" a soundtrack of narration and background music. This is done by putting voice on one channel and music on the other. You could do this in real time, but any mistakes would require a complete retaping. A better technique would be the following:

1. Record the narration; edit all mistakes out of it. If there needs to be silent segments for concentration on the visuals, edit in an appropriate length of leader tape (7½ inches or 3¾ inches per second).
2. Dub this directly from one tape recorder to the left channel of a second stereo tape deck.
3. Choose an appropriate length of music, either full version or edited.
4. Dub the music onto the right channel of the second stereo recorder, while playing back the left channel to allow you to monitor timing and volume. Do not overpower the narrator, but do boost the music when it is to be used alone. Use your ear as the guide, not just the VU meter. These two channels will be slightly out of sync because you will hear the left a fraction of a second before the right records, but this is usually negligible.
5. If you are dubbing stereo music onto the right channel, use a "Y" adapter to retain both channels of the original music.
6. Feel free to switch left and right from this suggested pattern since this is only a conventional arrangement.

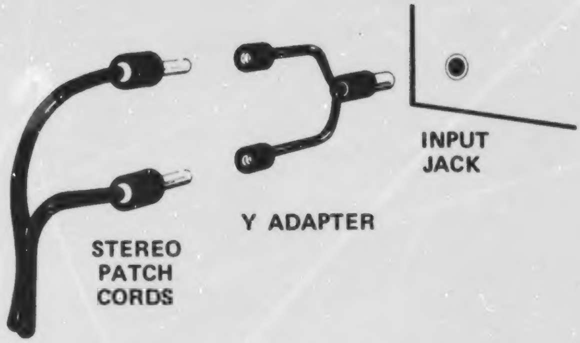


Illustration VII-12
"Y" Adapter Cable

Mixing

1. Patch all necessary sources into the mixer.
2. Decide if you will use *cross-fades* (sound is actually mixed) or *segues* (one source fades out, next one fades up quickly). Practice.
3. Predetermine good recording levels for each single source. Note whether two or more simultaneous inputs cause a total increase in mixer output volume. Ride gain on the master if necessary when adding sources.
4. It is probably best to monitor the mixed signal at the recorder. Also, most recorders will allow you a simultaneous playback through speakers while recording. This is still the input signal, not the playback signal, but you should listen to it through speakers and judge your final recording through a live mike.
5. Cue up all inputs tightly to avoid dead air between audio segments. Splice out dead air or mistakes or noises if they occur.

When Working with Tone Regulated Synchronizers

Many less expensive programmable two-projector dissolve/synchronizers work by first recording and then playing back an audio control signal on the soundtrack tape. This obviously requires the use of a stereo tape deck – a quadradial, or four track, deck would offer further control.

1. Record and mix your sound track with its narration, interviews, sound effects and music first.
2. Transfer that mixed material onto one track of a stereo tape.
3. Now, record your control signal onto the other track while listening to the sound track and simultaneously programming the slide advances/dissolves/superimpositions.

4. It is not advisable to do the visuals first because the audio portion is less likely to be flexible in timing. Recording the visual programming simultaneously with live narration recording is unbelievably hectic and permits the pick up of extraneous sounds like projector-mechanism noise.
5. The initial recording is best done on a reel-to-reel deck, but the working tape could be a cassette re-recording of the original. Cassette stereo decks offer portability unavailable with reel-to-reel machines. However, care must be exercised that the synchronizing control signal is not recorded at such a high level as to "bleed through" into the adjacent audio track.

Final Reminders

1. Try to avoid dubbing "acoustically," that is by recording from a speaker into a microphone. Patch your source directly into your tape recorder to retain the full quality and range of your original.
2. Play back your entire finished product. Tape surface can be defective and leave you with problems that you could not hear in recording.
3. Commercial records and tapes are covered by copyright, recording rights, publishing company contracts, and musicians' unions rules. At present, the only way to avoid conflict is to consult a music store for the names of companies that will sell you usable music and SFX. You can buy these original compositions with rights guaranteed for your use. If you wish to copyright music that you have composed or commissioned for your soundtrack, contact your local Internal Revenue Service office for further information.

CHAPTER VIII

PROGRAMMING THE PRESENTATION

James Hulfish

In the still emerging jargon of the multi-image specialist, the term "programming" pretty well equates with the term "automating." When we program a presentation, we are – in fact – automating it, equipping it to run automatically (or at least semi-automatically). So the origins of programming are essentially the same as those of audio-visual automation overall.

History of Automation

The history of A-V automation did not begin until the year 1939. It was in this year that the world's first automatic slide projector was introduced. Prior to then, slide projection had endured an extended push-pull-click-click period. Everything was manual because the projectors themselves were manual devices. Very manual.

With the appearance of the automatic slide projector, however, A-V innovators immediately sprung to the task of devising ingenious ways to somehow lock slide changes to the cue points within a prerecorded soundtrack. The search for the fully automatic, sound-slide presentation was underway. It led initially to the development of the device we today call a synchronizer.

The early scramble to find an ideal way to automate the single-medium, single-screen slide show produced an incredible variety of synchronizing systems. Among the earliest was a device which responded to moments of complete silence within the soundtrack. A two-second pause, for instance, could be used to trigger a slide advance. This ruled out such audio niceties as background music under your narration, of course, but it was applicable to both disc and wire recorded soundtracks, the only two audio media available in those early Forties.

The introduction of the tape recorder following the end of World War II opened up a whole grab bag of new techniques for synchronizing sound slide presentations. One system involved using a special rectangular notebook punch to put a hole through the soundtrack tape itself wherever a slide change was wanted. An electrical contact was made through the holes as the soundtrack was played back causing the slides to advance at the appropriate points. The greatest single drawback to this system was the recording tape of the early 1950s. It was pretty flimsy stuff compared to today's plastic tape stock, and the ever-present danger of tape breakage was hardly helped by punching it full of holes!

Other systems that were tried with varying degrees of success involved such things as making special pencil marks on the soundtrack tape at cue points, or applying metallic foil patches directly to the tape. In all of these early systems, the job of synchronizing was a rather tedious, time consuming undertaking.

It was not until the second half of the decade of the Fifties that the forerunners of our contemporary synchronizer first appeared. These devices recorded a musical note, or "pulse" onto the soundtrack, and, subsequently, during playback could translate this pulse into a momentary contact closure for advancing a slide projector. In some systems very low frequency "subaudible" pulses were integrated into the soundtrack itself, but the introduction of stereophonic tape recording made it possible to place audible-range pulses onto a second track fully separated from the soundtrack. This made it possible to revise a synctrack without disturbing the recording. (In subaudible systems it was impossible to erase and move a syncpulse without erasing the overlying soundtrack.)

In subsequent years the technology of the synchronizer has been refined and polished until there remains today little more to be asked from such a device. Corresponding improvements in the fidelity and stability of the tape recorder have also contributed to the high level of reliability achieved with today's synchronizer. These devices are now available as ultra-compact accessories for use with reel-to-reel and cartridge stereo recorders, and there is a wide selection of cassette recorders available with built-in synchronizers. The search for the effective synchronizer appears to have ended.

With the "shakedown period" behind them, manufacturers of synchronizers have joined together under the auspices of the National Audio-Visual Association (NAVA) to establish universal standards for these devices. The voluntary agreement consists of establishing the standardized syncpulse at 1,000 Hz, the length of this pulse (in fixed-pulse-length systems) to be standardized at 0.45 seconds.

Defining a Synchronizer

By definition, a synchronizer is a device to automate only one thing or event. That "one thing" may be a single projector, or, more recently, it may be a pulse sent to a single dissolve control to initiate a dissolve transition from one projector to the other, thus, the dissolve control is controlling, in effect, two slide projectors, but the "one thing" actually being automated is the dissolve control. As the search for the synchronizer was drawing to a successful conclusion, a new and far more difficult problem in A-V automation emerged.

Along came multi-image!

Automation and Multi-Image

Prior to the 1960s, the concept of multi-image presentation had appeared on the doorstep of the audio-visual community as the possible offspring of rather diverse and sometimes disreputable parentage. It's birth may have been attributable to this or that World's Fair, or this or that super-extravagant amusement park, or even possibly (it had to be reluctantly admitted) the utterly undisciplined but always flamboyant "light shows" of the day. It did not really matter. The fact is that with the decade of the Sixties, multi-image presentation began to descend from the exotic heights of it's origins and come down to the somewhat more pedestrian levels of trade conventions, sales meetings, and occasionally, even classroom instruction. And this descent carried with it a nightmare of new complexity for the boys in the back of the room – our ever-faithful projectionists.

Consider, for instance, what happened to the problem of the projectionist when we simply step up from a single-screen slide show to one involving three screens. At first glance the projectionist's problem would appear to be three times more complicated. But keeping in mind that the projectionist deals with cues, not screens, look at what actually happens:

Our projectionist has cues to advance (1) the left-screen projector, (2) the middle-screen projector, (3) the right-screen projector, (4) the left and middle-screen projectors simultaneously, (5) the middle and right-screen projectors, (6) the left and right-screen projectors, and (7) all three projectors simultaneously. So we have actually multiplied the complexity of the projectionist's job by a factor of seven. At any given cue point in the script, there is one correct choice . . . and six wrong ones!

Multi-image presentations frequently involve more than just multi-screen slide presentation, however. They often involve other media, motion pictures, video, special lighting effects and the like, all in addition to slides. To further aggravate these complications, something profound happened to slide presentation with the introduction, in the late Sixties, of multi-speed dissolve controls. Instead of having only one button to press to control slide advances on each screen, the projectionist suddenly found that he had four or five to press to control slide advances . . . on EACH screen! There was more than just one way to move to the next slide.

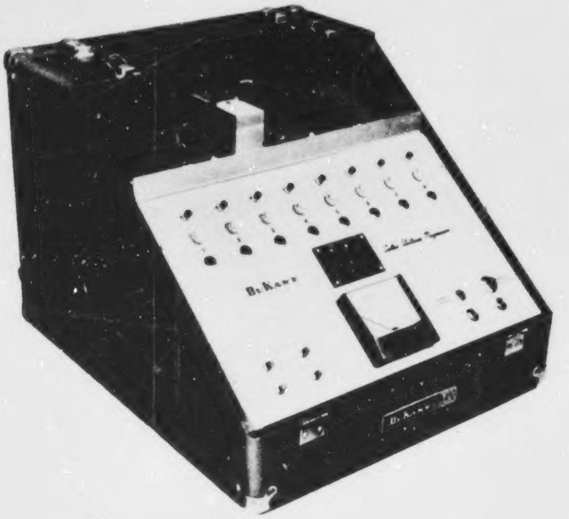
Clearly an altogether new need had surfaced, one that went well beyond the capabilities of a simple synchronizer. The projectionist found himself in desperate need of something to automate – or at least to semi-automate – these multi-image presentations.

Multi-image producers shared the same concern. Performed manually with a team of projectionists, early multi-image presentations required such large crews and demanded such long rehearsal times that they were prohibitively expensive for all but those few blessed with nearly unlimited budgets. Even thus blessed, there was scant assurance of a perfect performance resulting from a manually controlled multi-image production. Projectionists are human, and humans are all vulnerable to doing monumentally dumb things when subjected to the inevitable pressure of "showtime jitters." And when a producer's audio-visual presentation – multi-image or otherwise – fails to reach the screen successfully, it is utterly worthless. It simply does not matter how well it was conceived, how good it was "in the can."

The Programmer

What was needed, urgently, was some kind of audio-visual programmer. A programmer is defined as a device designed to automate two or more things, and the whole projection problem of the multi-image production was that it always involved at least two – and generally far more than two – "things."

Not surprisingly, the earliest approach to the development of an A-V programmer was to take the concept of the synchronizer a step further. The idea was to develop devices that could recognize and distinguish between pulses of different frequencies. This required the development of tone-type pulse systems which necessarily had to respond to far more discrete types of signals than any device functioning as a synchronizer. It really did not matter if a so-called 1,000 Hz synchronizer, in actuality, would respond to any pulse whose frequency might range from 300 Hz to 2,000 Hz (as some did in fact), and this "sloppiness" might even be viewed as a safety factor in a syncystem involving low quality equipment.



Picture VIII-1

The Custom Electronic Programmer by DuKane Corporation was the first "mass-produced" programmer designed specifically for the A-V market.

Picture courtesy: DuKane Corporation

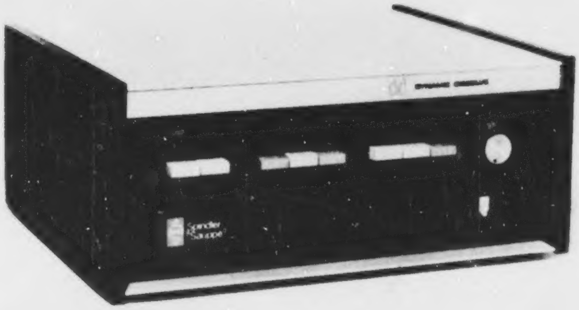
A multiple-frequency tone system would have to put out to a recorder and, subsequently, read back from it far more accurately "tuned" tones. Two developments of the late 1960s made this possible. The design of tape recorders was improved to eliminate any significant change in tape running speed when a change in the line power voltage was encountered. (Previously, when line voltage dropped, tape running speed slowed, and the frequency of the pulses would shift downward causing miscues.)

Rapid-fire developments in solid state electronics also made a major contribution to the reliability of tone-type programmers. In early, discrete component programmers of this type, changes of conditions in the environment (such as temperature or humidity) would affect individual components differently, causing unpredictable shifts in the original frequency settings. This meant that a unit had to be constantly "retuned" to perform consistently.

Contemporary tone-type magnetic programmers utilize integrated circuits which are affected equally by environmental conditions and avoid such shifts in frequency. Such programmers now boast an extremely high degree of stability and reliability.

While some A-V innovators were refining the concept of the synchronizer to serve the new requirements for a multi-tone controller, others explored the possibility of an altogether new type of pulse to be used for programming, the digital pulse. The digital pulse side-stepped the whole problem of tape-speed shift because it did not rely on a well-defined frequency to function properly. Frequency shifts which resulted from the normal aging of discrete components also created no problems for the digital pulse system.

The net result of these parallel efforts to create what might be called a "multi-channel synchronizer" was two types of magnetic tape programmers, both functioning essentially the same way, and both eventually achieving the same successful result. The sole significant difference between the tone-pulse and the digital-pulse programmer was the nature of the pulse itself, and, since they both arrived at a high degree of reliability, this was a rather academic distinction.



Picture VIII-2

The Dynamic Dissolve Control by Spindler & Sauppe was the first multi-speed dissolve control. It has five programmable functions.

Picture courtesy: Spindler & Sauppe

The Magnetic Tape Programmer

The magnetic tape programmer was (and is) the most straightforward, easy-to-use automating device available for multi-image productions. It looks and functions like a pushbutton remote control. Using it to program a presentation involves nothing more than literally running your presentation as though the programmer was a remote control. The difference is that as you run your presentation manually using the programmer, you are simultaneously generating and putting out pulses to the tape recorder which will subsequently run the production automatically exactly as you just ran it manually.

If a mistake is made in programming, it is a simple matter to erase it and make a correction. Reprogramming may be done to improve one cue or an entire section of a presentation. Once perfected, the programmed presentation should run perfectly every time thereafter. Happily, programmers are not subject to "showtime jitters."

Magnetic tape programmers in their simplest form do suffer, however, from two sometimes significant limitations: (1) They must be programmed in "real time"; and (2) they do not lend themselves easily to incorporating "live" presentations.

The expression "real time" means nothing more complicated in this instance than that you must be able to run your show manually at least once, to use such a device because the programming phase itself requires a manual runthrough of the show. If your show demands, for instance, that at one point twelve different things (or combination of things) are to happen within a period of five seconds, you will have only five seconds of elapsed time to select and press the correct sequence of twelve buttons (or twelve combinations of buttons) in programming this section. In other words, programming must be done at show speed.

Because the tape recorder is an integral component of the magnetic tape programming system, the magnetic tape programmer is restricted to pre-recorded or "canned" multi-image productions. (There are exceptions to this generalization, and some mag-tape programming systems allow fairly easy integration of "live," remote single-image presentation with "canned" multi-image presentation, but this restriction applies to all mag-tape systems which represent an extension of the synchronizer approach to automation.)

Nevertheless, if a multi-image production is simple enough to allow one to run through it manually – although there will be no problems with false starts and subsequent corrections and it is, in fact, a "canned" presentation – no solution to the problem of multi-image automation serves more neatly, nor more simply, than the magnetic tape programmer, be it a tone-pulse or digital-pulse device.

Yet, what about those two limitations?

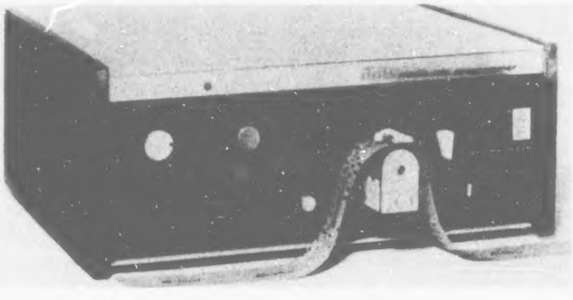
What if your presentation involves things that actually are too fast or too complicated to program in "real time"? Or what if it actually is to be a "live" presentation or (as is more often the case) "live" and "canned" presentation integrated together?

If the information we "store" on the pulsetrack of a mag-tape programming system is reduced to its essential components, it comes down to three catagories: (1) the sequence of events (what happens first, what happens next, etc.); (2) what those events are (a medium speed slide dissolve on the middle screen, a cut dissolve on the outside screens, a medium dissolve on all three screens as a motion picture comes on to the center screen, etc.); and (3) the time interval between these events (how long it is after cue No. 5 begins that cue No. 6 begins). In mag-tape programming the pulse themselves dictate the sequence of events and what those events are, and the space on the tape between these pulses establishes the time interval between these events.

The Punched Tape Programmer

The first A-V programming system to break up these categories of stored information (and, therefore, overcoming the two limitations of the mag-tape programmers), was the punched paper tape programmer. In a punched tape system, codes on the punched tape store only the first two categories of information, the sequence of events and what these events are. The punched tape does not determine the time interval between these events.

That is the function of either syncpulses recorded on the soundtrack tape (in a "canned" presentation) or the next time the projectionist (or narrator) presses a single-button remote control (in a "live" presentation). In this instance, however, the syncpulse or remote control is not operating projectors directly. Rather, it is operating the programmer which, in turn, is controlling the projectors, lights, and special effects.



Picture VIII-3

The Media Mix Programmer, by Spindler & Sauppe, was the first punched tape programmer to introduce a system of programming logic.

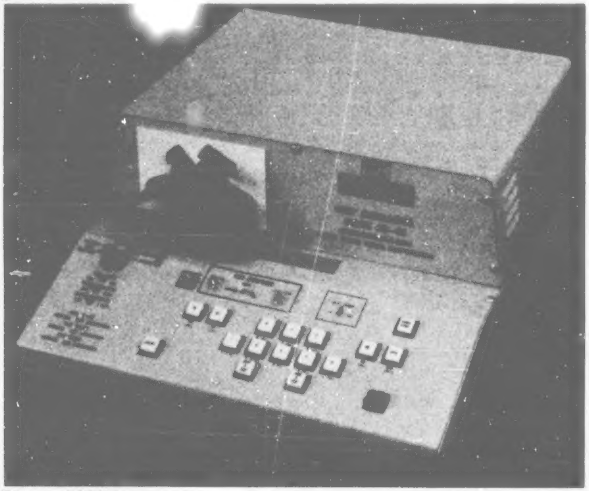
Picture courtesy: Spindler & Sauppe

This meant that punched tape programmers could automate presentations that were literally too complicated to program in "real time." A producer could punch his code holes into the paper tape for cue No. 35 and then take as much time as necessary to punch the exact combination of code holes for "things" that he wished to have happen during cue No. 36, even though cue No. 36 might follow cue No. 35 by only three seconds in the finished production.

It is true that once the punched tape is prepared, the final step of recording a synctrack is a "real time" job. But at this point all the complex decision making has been recorded on the punched tape, and recording a synctrack for a programmer is no more complicated than preparing one for a single projector sound-slide presentation. Just one button to press; just big red dots on the script to indicate when to press it.

The origins of the punched tape programmer are as cloudy as the origins of multi-image presentation itself. The very earliest units were all one-of-a-kind devices designed and built to meet the specific requirements of a particular production. A show was conceived first, and then the hardware was designed to control it.

It was not until the mid-1960s that the first programmer specifically designed for the audio-visual market was actually put into (somewhat limited) production. These early production programmers all utilized a straighforward coding system. Each hole position across the program tape represented one device which might be automated, and each time that hole was punched the corresponding projector would operate, regardless of whether or not other adjacent holes were also punched.



Picture VIII-4

The Cuemaster 60-40, by United Audio Visual Corporation, was the first electronic keyboard punched tape programmer.

Picture courtesy: United Audio Visual Corporation

Thus if the programmer accommodated eight-hole computer tape, it was an eight-"channel" device (meaning that it could automate eight projectors); if it used 22-hole tape, it was a 22-channel device. The number of programming hole positions across the width of the paper programming tape determined the number of channels the programmer made available. And the only way to increase the number of these channels was to increase the width of the tape.

But in the mid-Sixties even the eight channels available from standard computer tapeprogrammers were more than adequate for most multi-image presentations. After all, a show involving eight slide projectors on eight screens, or even a show involving both slides and movies on four screens, was a pretty elaborate production even by today's standards.

The event which abruptly created a need for far greater channel capacity in punched tape programmers was not actually a trend toward bigger and bigger shows involving more and more projectors. Rather, it was the appearance in 1969 of the multi-speed dissolve control. These devices gobbled up programming channels in a way that no other audio-visual device had before or, for that matter, has since.

The very first multi-speed dissolve control featured five programmable functions, consisting of three different dissolve rates plus two special dissolve effects. Each of these five functions required its own programming channel to automate it. Consequently, when this control was used in a multi-image production, five channels were needed just for changing slides on one screen. Obviously, eight-hole computer tape was hardly up to this new requirement. It could not even completely automate a two-screen multi-speed dissolve production with its eight channels.

Stepping up to wide tape formats, unfortunately, introduced new problems. As the tapes got wider, the programmers and tape punches got larger and more costly. The large format tapes were also far more difficult to proof. A new system for coding the program tapes became essential. This led to the development in 1970 of the first A-V programmer to incorporate a system of "programming logic."

As is true of much of our multi-image vocabulary, the term "logic" is one that was borrowed from the computer field. And in a sense, this new generation of programmers employed a primitive form of computer logic. As used within the multi-image community, however, the term "logic" does not actually mean anything very exotic.

In a coding system involving "programming logic" hole combinations are used to create additional channels. It was pointed out earlier that the control of just three projectors involves a total of seven possible cues. By the same token, with three-hole tape there are seven possible code combinations that might be punched: (1) the No. 1 hole alone; (2) the No. 2 hole; (3) the No. 3 hole; (4) the No. 1 and No. 2 holes together; (5) the No. 2 and No. 3; (6) the No. 1 and No. 3 holes; and (7) all three holes together. (It is even possible to let the absence of any punched holes become an eighth code.) It is apparent from this that with eight-hole computer tape there are hundreds of possible hole combinations. But that suggests a problem: How can anyone learn all these possible combinations?

That is where the second half of what is meant by the term "logic" comes into play. Rather than making a random use of these hole combinations (which would result in a need to memorize them all), these combinations are organized in some orderly way so that by just learning a few of them you can figure out for yourself all the other possible combinations which you might ever require. In other words, by learning a small minority of them, you can logically work out all the rest.

One simple example should serve to illustrate how "logic programming" works and how it achieved an enormous economy over the previously available "non-logic" programmers: The original multi-speed dissolve control had five programmable functions which means that to use it on three screens would require a programmer using 15-hole tape in a "non-logic system" (a hole for each function on each screen). The first programmer to use "logic programming" handled this same setup with standard eight-hole computer tape. It let five of the programming hole positions represent the five dissolve functions and the remaining three represent the three pairs of projectors. Thus, if you wished to program a medium dissolve on the outside screens, it was only necessary to punch the hole which represented medium dissolve plus the two holes representing the projectors for the outside screens.

The introduction of "logic programming" systems also carried with it the innovation of introducing timing codes which could be used to stagger a whole series of events to happen within a single cue. For instance, timing codes might be used to space out the steps of a three-screen slide change so that, rather than happening simultaneously, the changes would occur automatically at precisely one-quarter-second intervals. Timing codes also made it possible to create ultra-high speed effects that could not be programmed any other way, such as flashing lights effects that exceed anyone's ability to press buttons.

Much of the subsequent development in punched tape programmers during the first half of the Seventies concerned itself with increasing the speed and ease of the programming step itself. From the original, totally manual pin-type punches that were used with the first punched tape system, mechanical keyboard punches were made available, as were electric keyboard punches and duplicators which relieved the producer from being required to know all the intricacies of the programming logic employed.

Electronic Memory Banks

By the mid-Seventies, innovations in A-V programmers were coming on the market fast and furiously. Perhaps the most significant was the use of electronic memory banks to "store" programming information in much the same way that punched tape is used to store information. Again, the chief advantage of microelectronic memory banks as an alternative to punched tape is the ease with which information stored in the memory can be corrected and changed. With punched tape systems, deletions must be spliced out of the tape and corrections must be patched over and repunched. Changes in memory bank systems may be made by the pressing of buttons.

Picture VIII-5

The Command Performer System, by Arion Corporation, was the first to store programming data in electronic memory banks.

Picture courtesy: Arion Corporation

Although an entire show may be presented with the programming being fed directly from the programming device's own memory banks, a loss of power, either during the programming process or during playback from memory, immediately induces a case of electronic amnesia. Consequently, memory banks are not viable as a medium for the permanent storage of programming information. Such programming data must be converted to digital pulses and transferred on "dumped" (that is, recorded) onto audio tape to preserve it between showings. At present there are two approaches to "dumping" memory bank programming for storage. One is to record the digital data cues directly onto the soundtrack at the appropriate cue-points. In playback the programmer reads the cues in much the same way as a conventional mag-tape programmer does in far simpler systems.

The limitation in such a system is that it requires a relatively high level of quality in both the tape recorder and the recording tape to successfully record complex high-rate digital pulses reliably. Even with relatively high quality equipment and tape, each digital pulse must be repeated several times to assure the kind of redundancy that provides an adequate safety margin.

The alternate system dumps its memory information in a cluster onto a high quality, computer data tape which is an integral part of the programmer. This data tape is unrelated to the soundtrack tape, and its sole function is storage. It is subsequently used to re-enter the programming back into memory at a high speed for use during presentations. In this system, simple tone sync-pulses are placed onto the soundtrack tape to trigger the digital cues from the memory banks.

Still another system uses a memory that is kept alive by battery when the system is switched off. Infrared light-erasable memories and "bubble" memories are now available but so far have not been used to store cues in an audio-visual programmer.

Perhaps the most promising of all the new innovations to arise during the mid-1970s, however, was the wedding of a microprocessor to an electronic memory bank programming system. The full implications of this combination are now coming to be fully realized, but some are already conspicuous. The dramatic feature, without doubt, is the ability of a multi-image system to track the slide projectors automatically to any cue-point, or to automatically "home" to cue No. 1 at the press of a button. Multi-image control systems which can back up as well as advance on demand open up a whole new frontier of flexibility in this previously rock-rigid medium.

Picture VIII-6

The Show Pro III Multi-Image System, by Audio-Visual Laboratories, was the first A-V programmer to incorporate a microprocessor.

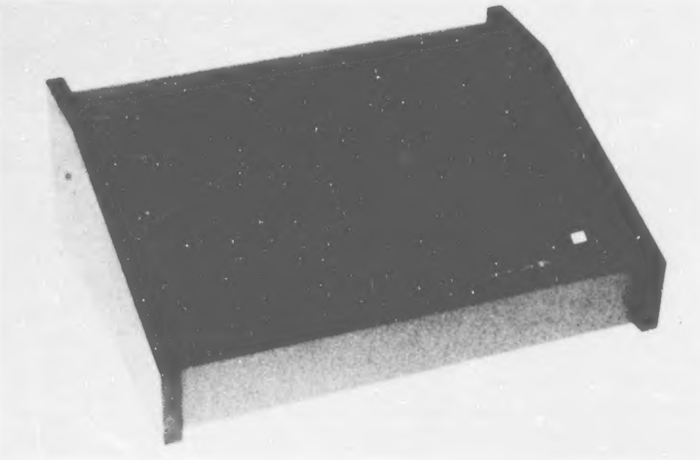
Picture courtesy: Audio-Visual Laboratories

Choosing What You Need

It is worth observing, in retrospect, that the entire development of the commercially available audio-visual programmer has occurred in something only slightly more than a decade. It has been less of an evolution than an explosion. It would be foolhardy to try to predict at this juncture just where it is ultimately headed, beyond, perhaps, suggesting that it is headed there very fast indeed. Yet, in this rapid-fire world of multi-imagery there is one consolation amid the confusion of hardware. To the question, "What is my first consideration in selecting a programmer?", there remains only one wise response: "Your show." If it is simple enough to use a mag-tape programmer, a mag-tape programmer is almost certainly your best choice. If it is a "live" multi-image presentation, a punched tape programmer may be the best for you. If it is but one of an on-going, highly complex series of productions, a computer based programmer may be the only choice. Although the difference between a show and no show at all has sometimes been a matter of the hardware, rarely if ever has the difference between a great show and a so-so show been a matter of the hardware.

When a great multi-image production comes to the screen, it reflects the creative juices of its producer in saying something honestly, judiciously, and aesthetically. He made the difference. All the programming system did was get it onto the screen for him.

Happily, most programmers today can at least do that!



Picture VIII-7

The Wollensak Digi-Cue is offered in two models–the Pro 6Q and Pro 9Q for 6 or 9 channel operation. Both programming and playback functions are performed in the single console. It enables the processing of massive quantities of information with high reliability.

Picture Courtesy: Wollensak 3M

CHAPTER IX

THE PHYSICAL ENVIRONMENT

Carl Beckman

One of the most overlooked aspects of multi-image production and playback is the physical environment in which these two activities take place. Without careful preplanning of the environment, production can be needlessly time consuming and the effect of the finished product diminished. If you are trying to produce programs within budget constraints or are in the business of making money by producing multi-image presentations, then production time becomes a critical economic factor.

It is easy to see why the physical environment is often overlooked; the two most exciting aspects of working with multi-image are production and playback. Most of a producer's energies are dedicated to scripting, shooting, assembling the slides and the audio segments and programming the final presentation. All of a producer's emotional energies are directed to the excitement of the eventual playback. Concern for the limitations imposed by production facilities frequently becomes an afterthought and in the rush to get the images on the screen critical compromises may be made.

The purpose of this chapter is to examine those physical and organizational aspects which can contribute to an efficient production process and which will help in attaining a quality end product, presented under the best possible circumstances.

This chapter is broken down into two sections, first a discussion of the multi-image production laboratory and then a discussion of the playback facilities. It should be understood that while this chapter does cover several areas of the physical environment it can not be definitive. However, this statement is not meant as a disclaimer. Multi-image is a rapidly growing field. Each day new discoveries are made which contribute to the general fund of knowledge about multi-image.

It is hoped that you will take what is written here, use it as a jumping off point, and expand your awareness of those aspects which are incorporated in the physical environment of multi-image.

The Multi-Image Laboratory

In all probability this section will be the most controversial. Each producer approaches the creative act differently. As a result, no hard and fast rules can be applied in setting up a production facility. This is not to say however that certain commonalities in organizing a workshop cannot be established. Agreement can be reached on several needed areas such as slide storage facilities, as well as facilities for sorting and copying slides, screening the presentations and rooms for audio recording. These five areas are the most germane to multi-image production. Separate facilities for slide duplication and film processing would be nice to have but are not absolutely necessary.

Slide Storage

Providing for proper slide storage and ease of retrieval is probably the weakest aspect of almost any production facility. I feel that I can say that without reservations. Most often slides will be strewn about or packaged into little bundles with rubber bands, and only sometimes are they collected into slide tray boxes. An incredible amount of time is wasted searching again and again through hundreds of slides looking for the right one. Unless you have a memory like a computer or a master librarian, you need to develop a slide storage and retrieval system.

Your first consideration is equipment. The Multiplex and Abodia slide storage cabinets are both excellent but extremely expensive. Depending on the model and storage capacity, each can cost from $450.00 to $800.00. The Multiplex is a functional storage system which features slide-out trays and a lightboard behind the trays. Each tray can hold up to two hundred slides. The Abodia cabinets look like fine furniture (which they are) and also incorporate a tray storage system with a lightboard. The advantage of these two systems is that they both allow you to look at many slides at once thereby reducing search time. If these two systems are more than you can afford, then consider the system made by Neumade. Each cabinet has a capacity for 5,000 cardboard-mounted slides and consists of five drawers in a very compact steel box. The boxes are stackable and they come in different colors – each costs around $85.00. Each drawer comes equipped with separator tabs for five rows of slides.

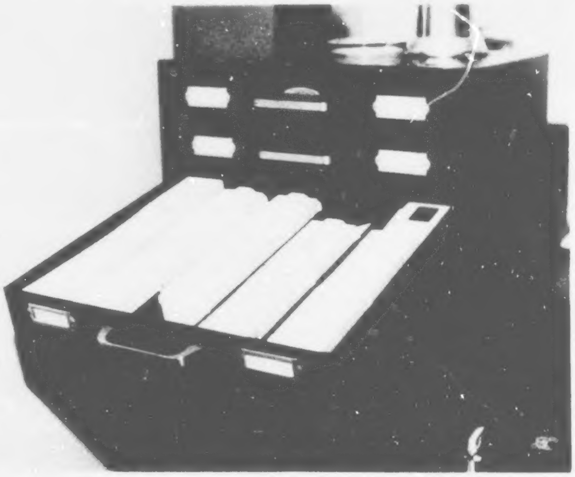
Few people realize the importance of proper slide storage. Dust, extremes of heat or cold, too high or too low humidity are the enemies of slides. When not in use, slides should be stored in a dark area. Light, over a period of time, causes the colors in slides to fade. Movement of dust will scratch the slide surface, causing a loss of resolution or image sharpness. Heat or cold will make slides brittle as will too low a level of humidity. On the other hand, too high a level of humidity can encourage the growth of a fungus which feeds on the emulsion. Many of the slides you might take now may seem to be of little value to you. Yet in the years to come, those same slides may well take on added importance and value. If a picture was worth taking, it is probably worth preserving.

The Neumade slide storage file system seems to offer a compromise between the very expensive Multiplex and Abodia systems and the small very inexpensive Smith Victor slide storage boxes. Although the Smith Victor boxes cost only around $4.00, they should really be used only for short-term production storage. Smith Victor boxes each hold around five hundred slides. I use them to organize all the slides that I shoot for a given production. Once production is complete, all the out-takes (slides not used) are filed and stored in the Neumade cabinet. My Neumade boxes sit on top of my four drawer file cabinet in the corner of my office. Since this office is located in my home which is air-conditioned in the summer and humidified in the winter, my slides are well protected.

Slide Cataloging

When preparing to write this section I talked to media librarians and did some research. The librarians, while trying to be helpful, only succeeded in confusing me with their classification schemes, the organization of knowledge, Anglo-American Cataloging Rules, OCLC, LC, and so forth. Next I turned to the fourth edition of *Standards for Cataloging Non-Print Materials*, published by the Association For Educational Communications and Technology. This book is somewhat less complicated but its system is still too sophisticated for my preference. Thus, I have decided to share with you my own personal cataloging system. It works for me and I trust it will work for many of you with some modifications.

It is important to remember that my system was designed to be compatible with the Neumade five-drawer (SF-5-S) slide file – which holds approximately five thousand cardboard-mounted slides. It is also important to understand that this system is primarily intended for the private use by you, the photographer. If others are to use the system as well, then it becomes necessary to go to a more complicated system.



Picture IX-1
A Neumade five drawer (SF-5-S) slide file.
AMI Collection

Each drawer has five rows for slides. On either side of the pull handle on each drawer (i.e., on the outside) are label tag holders much like those used with file cabinets. Each storage row in each drawer is assigned a number and a letter, L = left side, (the two rows on the left), C = center, (the single row in the middle) and R = right side, (the two rows on the right side). Each drawer itself is given a number, 1 through 5, starting at the top.

All of my slides are separated into one of four basic categories:

1. Vacation – All of those slides which were taken on a vacation trip with no particular purpose other than to record the scenery. In this instance, all of the best slides are put into Kodak carousel trays, each tray is labeled, and the box is labeled. The box with the tray is then stored on a shelf. The

out-takes left over from these vacation trip rejections are then filed in the Neumade cabinet;

2. Multi-Image Production – All of those slides which were shot for a specific production. Here again, the finished production slides are stored in labeled trays and the out-takes are filed in the Neumade cabinets;
3. Stock Slides – These are slides that were shot with the idea that at some time in the future they might be used in a production. These slides pertain to every conceivable subject. Such a category might well seem like a waste of money, but it is not. Stock slides actually do save money. At some point in time, during some upcoming production, you will need a slide of a certain subject. If you have it in stock, you have just saved valuable time and money.
4. Special events – These are slides taken at various folklife festivals, craft shows and other such public gatherings. Actually, since I attend many folklife festivals, I have a special category for this grouping, but I do consider it a subset of special events.

Using these four broad categories I have cataloged my entire collection of slides. Searching for any particular slide begins at the card catalog that I also maintain. I use a small 3"x5" steel card box with 3"x5" plain white cards and 3"x5" separator tabs.

Remember, each card can represent any number of slides which fall under a given category. (Some systems treat each slide as an individual book, which means a separate card for each slide – Such a system would take me years to catalog and is not necessary for my usage.) Note also, that it is equally feasible for some slides to be usable under several categories of cataloging. So, occasionally one slide may appear on several catalog cards – a process of cross referencing.

Cards for each of the four categories in my system look like this:

VACATION
R-1
BUD-H
Budapest, August 1975

Approach to Buda via Danube.
City scenes of Buda and Pest,
*Night scenes of Pest and Fishermen's Bastion in Buda, beggars, monuments, the zoo.

R-L = The right side of drawer #1
BUD-H = Main entry
Main Body = The series statement. This statement should be complete enough to jog one's memory.
* * = These slides are deemed of unusual quality or may be extremely unique.

Example No. 1 of Vacation entries

R-3
CARIB

August 1972. An extensive three week trip to:

Guadalupe, Martinique, St. Kitts, Antigua, Dominica, Neva and St. Thomas, in the Caribbean.

Example No. 2 of Vacation entries

MULTI-IMAGE PRODUCTION
L-5
OT-WEL

"Welcome to Our Land,"
National Education Association,
1976, Washington, D.C.

Premier – out-takes from Washington, D.C. city scenes, various people, and important buildings.

OT-WEL – Out-Takes from "Welcome to Our Land."

In the main body appears the title of the show, for whom the show was done, and the year it was completed. Only one card was needed for the out-takes of this particular show since almost the entire show, except for the Washington, D.C. slides, was assembled from stock slides. If more than one card is needed, then it helps to put a "see also" notation at the bottom of the card. (For example – See also R-5.) This cross reference directs me to another row or drawer area, should I run out of room in one particular area for a series of slides.

STOCK SLIDES

C-5
COLO
Rocky Mts., summer and winter

Estes National Park, Georgetown, Golden Central City, Denver, Boulder.

See R-5 COLO

COLO-Colorado

R-5
COLO
*Rocky Mts. A Series

Photos of an old snow-covered barn in Georgetown.

See C-5

Example #2 Stock Slides

SPECIAL EVENTS

L-4
FL
Folklife festival held each year in Washington, D.C. on the Mall.

Pic's include people of all nationalities, folk dancing, eating, singing, also includes American Indians.

Listed by year 70, 71, 72, 73, 74, 75, 76

FL = Folklife

C-4
POL-F
Polish Festival, Baltimore 1974.

Dancing, singing, eating, *Senator Sarbanes speaking (several) – Past Senator Mac Mathias speaking, plus Polish ambassador.

Example #2
Stock Slides

POL-F = Polish festival

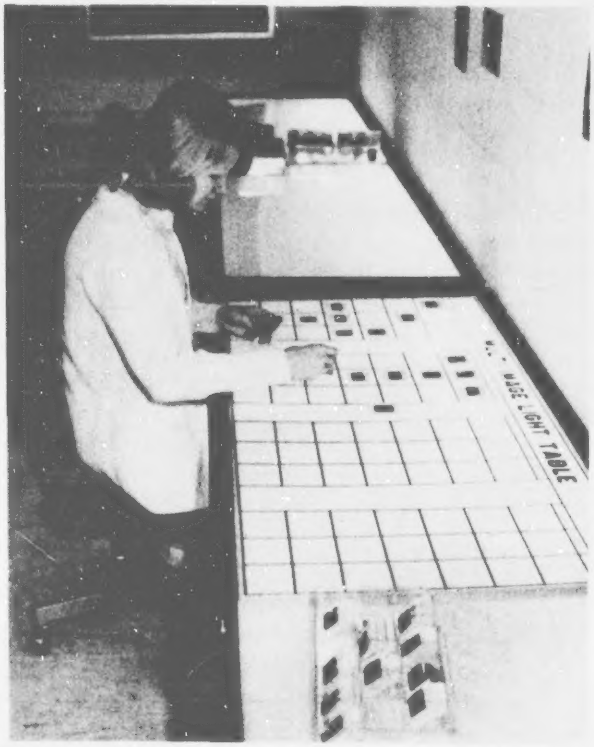
With this system you search by drawer position and not by subject, author, or title. Such a system requires intimate prior knowledge of the contents and is useful only to you the photographer, with your special knowledge. If you want to design a system that other people can also use, then I would suggest that you do use the system suggested by the *Standards for Cataloging Non-Print Materials*, published by the Association for Educational Communications and Technology (AECT).

The ultimate value of any system is the speed and ease with which you, the user, can find the slides you need in order to put together a multi-image presentation.

Slide Sorting

Once you have located the slides you need to assemble your show you will need some light tables or sorting boards. This seems to be a weak part of most facilities, even the most up-to-date and professional of facilities. At least forty square feet of illuminated viewing space seems to be a minimum for adequate sorting and assembling. Most facilities have available less than 8 or 10 square feet of illuminated surface.

Leedal Inc. makes a combination storage and sorting board, but it too is expensive. Again let me emphasize that if you can afford it by all means seriously consider the Leedal light tables. They are beautifully designed and well built. Most people make their own from sheets of 2'x4'x1/8" translucent white acrylic plastic sheets. The light source may be one or two double tube 80 watt cool-white fluorescent fixtures. The plastic usually sells for $20.00 and the fixtures run $10.00 to $16.00. The crucial materials for forty square feet would thus cost $180.00. The actual cost, including necessary lumber, and so forth, may well run substantially more, since obviously these sorting boards require some sort of support structure. (Figure 2).

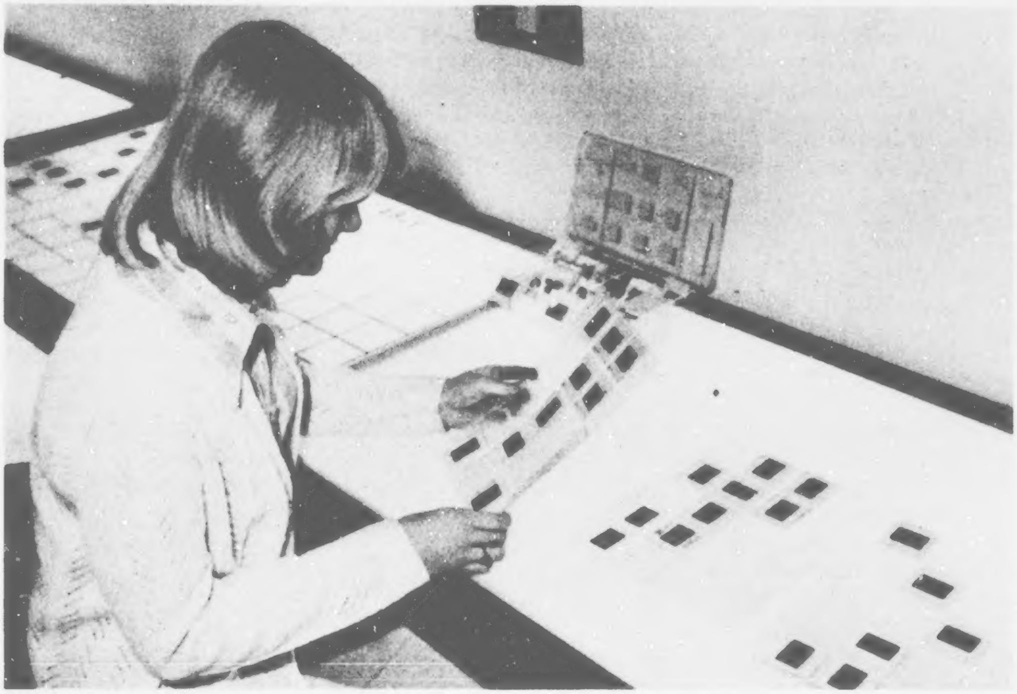


Picture IX-2
A multi-image light table.
AMI Collection

Using these boards would provide the producer with 40 square feet of space. This would in turn provide room for a theoretical maximum of 1440 slides (in actuality perhaps between 1000 and 1200) so that entire shows can be laid at one time. Such a system significantly speeds up the assembly and sorting process and reduces the likelihood of mistakes.

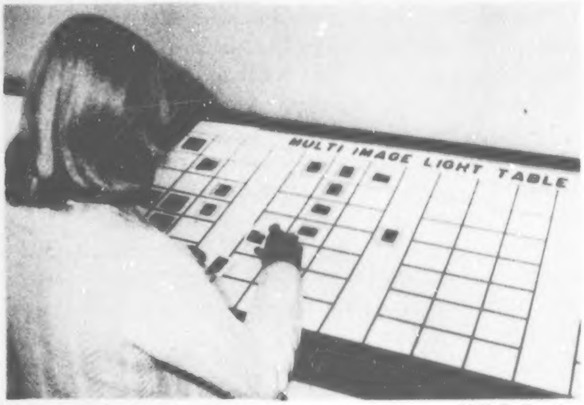
If the slides for any particular show must be removed frequently, in order to free up space for others to work on other shows, then slide pages are the answer. Each page is assigned a number and an entire show can be laid out and taken up in a matter of minutes. This approach allows several producers to assemble their shows using the same facilities with its sorting boards

The acrylic plastic is available from any commercial plastics dealer and the fluorescent lamps may be bought from hardware stores, building supply houses, or even from some drug stores.



Picture IX-3
Using slide pages.
AMI Collection

It is helpful to reserve some of the board space for all the slides that you think you will use in the show, whereas the rest of the board space would be used to actually assemble the show.



Picture IX-4 AMI Collection
Spacing slides on the board.

The opportunity to view large and entire segments of your show as finally visualized, at one time, is the major advantage of using large areas of sorting boards, such as suggested.

Attention to careful location of slide sorting boards is important to improve the efficiency of the entire production process. Thus, the boards should be located near the programming area or near the screening room, if the programming and screening facilities are combined.

Boards should also be located away from heavy foot traffic to avoid having entire assembled segments either bumped or distrubed by the curious passersby.

In-House Slide Production

Slide Production

There will be many occasions when you'll need to borrow slides or duplicate existing slides, or an entire show. (Remember that deliberate repetition of a slide is a frequent "device" used in multi-image programs.) Thus, consideration should be given to the purchase of a quality slide duplicator.

You can always have slides duped by a lab but they will be expensive and frequently take longer than possible. The least expensive commercial duplicates will cost .30 per single slide duplicated and may cost as much as $3.00 per slide. Slide duplicators usually pay for themselves. Before you buy, check out the duplication system. Slide duplicators usually incorporate a camera and a strobe mounted on a stand. The National Audio Visual Association (NAVA) *Equipment Directory* is a good starting point for locating slide duplicators as well as nearly every other piece of equipment you may need from time to time.

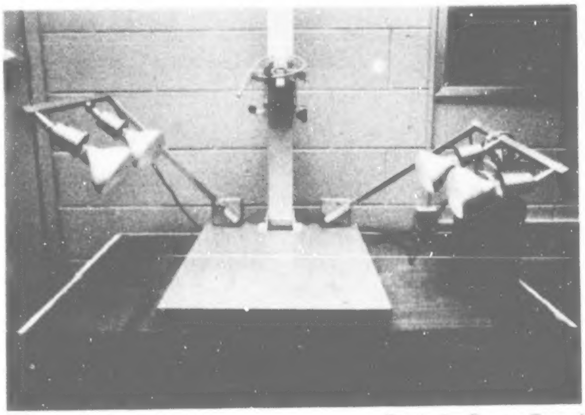
Slide duplicating devices offer several advantages. One can use them to correct for over and under-exposed slides, or one can even color-correct poorly illuminated originals. By using a series of filters you can add or subtract color. With some duplicating arrangements, you can also enlarge, crop, and make double and triple exposures as well as make reductions with more sophisticated equipment.

The slide duplicator that you should buy should be a precision instrument that provides you with expanded creative range and thus can become an important element in any multi-image production facility.

The slide duplicating setup should be located in an area where the room lights can be turned out without interfering with other on-going production procedures. Room lights can affect duplicating exposures enough to throw off precisely made exposure calculations.

Copy Stand Area

The copy stand for making slides from graphic materials need not be in a separate room. It could very well be located in the same room as the graphics lab. About all the facilities that it requires is a good stable and sturdy tablethat is much larger in surface area than the copy stand. This additional surface area can then be used to stack books and magazines from which slides will be made.



Picture IX-5 Photo by Duane Troxel
A copy stand.

Copy stands themselves come in all sizes and prices. Again, it helps to consult your *NAVA Equipment Directory* before buying a copy stand and to ask others what they think of theirs.

Graphics Laboratory

Making graphs, maps, charts, title cards, etc. is going to require some space. The graphics lab should be located in a separate facility. It could house the copy stand and if necessary the slide duplicator. The graphics lab should have plenty of storage space and a sink.

The graphics lab should be equipped with a large drafting table, paper cutter, drymount press, worktables, and storage cabinets. Here again it is best to look at other facilities before setting up your own.

Graphics labs should always seem too large to begin with. For some unknown reason they always fill up and overflow with the passage of time.

Audio Recording

More sophisticated multi-image production facilities will usually also have an audio production room and a rudimentary sound studio. This particular aspect of multi-image production can easily become very expensive.

Even if your budget is very limited or you are planning on redesigning an existing facility, you should make arrangements for at least a primitive voice recording studio. This does not have to be very big – in fact some such "studios" are little more than converted storage closets. A sound deadening rug on the floor, acoustical tile on the walls and ceiling, and a new solid door with a large and thick double-paned window is sufficient to get started. Careful research should be done before tackling the problem of building audio production facilities. Your best bet is to visit other major multi-image production facilities to see how they have done it and to listen to advice. By following their recommendations, you can avoid a lot of pitfalls that menace the beginning producer.

In some cases you will find that the recording studio is located some distance from the audio assembly studio. Production does not suffer from such separation, but combined facilities do make the producer's life easier.

Storage

As productions are completed, the resulting materials need to be stored. Metal storage cabinets are usually the best. Shelving could be built if desired, especially if the appearance of the room is deemed important. In any case, ease of access is important. In most facilities the program tapes are stored in a separate cabinet from which ease of retrieval is most important. Both of these cabinets should be in close proximity and segregated from areas where they could be easily tampered with.

Spare projectors, projector lamps, clean audio tape, microphones, headphones, blank slides, film, cameras and all the rest require space for storage and security. Security is very important since otherwise things begin to disappear. This is indeed unfortunate but remains a sad fact of contempory life. Equipment and materials storage facilities should be located in the most secure area possible.

The Screening Room

Careful attention should be given to the multi-image theater. If people are uncomfortable, the effectiveness of the show will be diminished and the audience's attention will wander.

Planning for a Screening Room

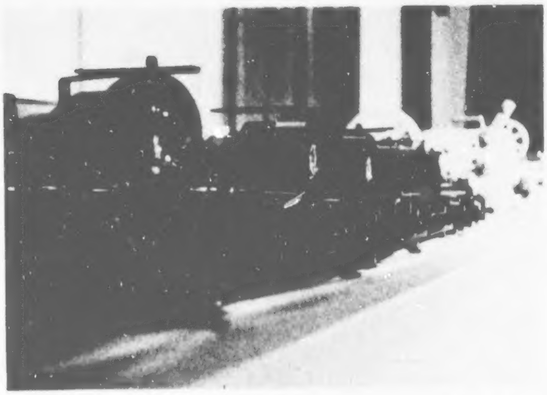
Proper room temperature and humidity are important for the comfort of the individual viewer. Air circulation is equally important. Even if there is proper ventilation, smoking should not be allowed for the comfort of non-smokers. Chair design is important. Chairs should be comfortable and spaced so as to allow unobstructed viewing of the screen.

An Ideal Screening Room

The most comfortable and handsome slide viewing theater I have visited is GTE's Telecommunication Center in Santa Monica, California. This theater features 16 overstuffed, swivel arm chairs on three-tiered levels. The curved screen will accommodate up to five images side by side and looks as though it floats. Each seat is the best seat in the house.

Projection is front screen and colored lights behind the screen are flashed on to the accompaniment of music prior to the start of each show. Wall-to-wall carpeting deadens any echoes and recessed lighting is employed to create a soothing atmosphere. After a few minutes in this room the viewer is relaxed and ready for the show. The sound system plays a quadraphonic sound track and the room's color scheme is dark brown combined with burnt orange which reduces spill light from the screen. The room temperature is carefully controlled and ventilation is more than adequate. The total effect is very pleasant and induces one to be more than ready to listen and see whatever GTE has to say and show its audiences. The end purpose of this room is to market GTE's services to its potential clients. By using such a facility GTE has given itself every possible advantage.

Such a theater represents an ideal. Your facility should be designed so as to incorporate as much as possible of such an ideal.



Picture IX-6 AMI Collection
A bank of front screen projectors.

Screens

Before deciding on the material to be used, you must decide between front screen projection and rear screen projection. If minimizing cost is not a factor in your decision, then choose the rear screen approach.

With rear screen projection all of the equipment is behind the screen and out of sight, and is thus not a distracting factor during the presentation. Rear screen systems work especially well in rooms with low ceilings and flat floors because the projectors do not have to be raised high above the heads of the audience. Nothing is more distracting than having someone's head appear in silhouette on the screen. With rear screen projection, people can be seated much closer to the screen than with front screen projection, which is especially desirable when you want as large a seating capacity as possible.

One very important consideration in setting up a rear screen facility is the use of mirror lenses on the projectors. This eliminates the need to reverse the slides in the trays when one needs to travel with the show and when one must use front projection.

Another consideration is to securely fix the projectors in such a way that they will stay in alignment. It is very bothersome and time consuming to readjust the projectors each time you screen a show. Buhl Optical of Pittsburgh makes a two projector template which does the job nicely.

For both front and rear screen projection, very careful attention should be given to the screen material itself. For front projection, screen reflectance and angle of view are two major elements to consider.

Screens are made of several different fabrics and coatings. A great deal of research should go into the selection of the proper screen. For example, if the seating arrangement requires people to sit far to the sides of the screen then a matt screen is the obvious choice. This screen affords the widest angle of view from optical center. Depending on quality and size, screens can become very expensive. There are many tradeoffs involved in screen purchasing.

Screen reflectance is a very critical factor in image quality. The better the coating, the sharper and brighter the image. Shows can be significantly diminished by poor quality screens. A screen's reflectance factor is measured by how much of the projected light it will reflect back on the audience. Remember that no matter how good the projected image, it can not compensate for a poor screen. It should also be noted that with rear screen projection a lot of light is absorbed while passing through the screen. Here again it is important to consider the type of material used to build the screen. A cheap material will result in heavy light loss and result in diminished image brightness.

The presence of ambient room lights can also diminish the effectiveness of a presentation. Much of the light that reflects off the screen "spills" over onto other objects. If the objects in the room, such as the floor, walls, and ceiling are light in color, they in turn will reflect back a lot of light in the form of "ambient light." This ambient light in turn diminishes the relative brightness of the images on the screen. Ambient light is obviously controlled by selecting screening room colors so as to provide low reflectance. The darker the color, the less reflectance. If you have control over the room's decoration, then you can choose these colors in several combinations such as orange and brown, blue and green, red and orange, and so on.

Sound Reproduction Considerations

The dispersal of sound is also a complicated subject and can only be dealt with in a cursory manner in this section. Some facilities are built with room acoustics in mind, whereas most viewing rooms are set up without any concern for acoustics whatsoever. Most of you will be confronted with the latter. With that in mind, loud speaker size, quality, and placement become the most critical factors.

If your screening room will accommodate more than six people, then ordinary book shelf type speakers won't do. For some installations that will house up to 20 people, the larger home speakers will suffice. For large rooms (more than 20 people) you should only consider auditorium speakers. Speakers designed for auditoriums permit the full range of originally recorded sound to be heard.

Turning the volume up on a small speaker won't help. Overdriving small speakers results in poor sound.

The best approach is to visit some already existing facilities to find out how they dealt with acoustics. In any event, you should do a good deal of research here. The purpose of all this attention is to produce good, clean, clear sound. You will find that as much as 50% of the impact of your show can be attributable to the effectiveness of the sound. If the sound quality is poor, your audience will very soon give up trying to listen. This will result in a very negative attitude toward your show no matter how well written the script or how good the visuals may be.

Some theater installations use as many as five speakers. This requires sophisticated amplification equipment, but the results can be spectacular. A major manufacturer of acoustical equipment that I know has a multi-image theatre in their factory. Five speakers are used and I have never heard sound reproduced that well before or since. The sound quality is so good that it in fact rivets your attention to the action on the screens. It was evident that a lot of thought went into the building of this facility.

Climate Control

Air circulation is an important factor in assuring continued audience attention. If the air circulation is poor, the carbon dioxide level can build up quickly and the audience will become drowsy. Even if air circulation is excellent, it is best not to allow people to smoke. While smokers themselves are desensitized to the effects of smoke, most non-smokers are highly sensitive. If you allow smoking, the non-smokers will not be able to enjoy the show and you may lose much of your audience.

Try to keep temperature and humidity at the optimal levels. Too much variation in either direction will distract from the viewer's attention span. In order for people to be receptive, they need to be comfortable. People cannot wait to get out of an oppressive environment.

Seating

The type of seating selected is also critical to assuring viewer attention span. Seats should be of the type that allow people to relax but not to the extent that attention wanders. Seats should obviously be arranged for unobstructed viewing. While all of this seems perfectly obvious when written down, it is often overlooked in actual practice. A flat floor creates the most problems. If bigger people sit up front, they will obstruct the screen no matter what. Tiered seating or a sloping floor are the best, but it is not always possible to achieve this effect if you have to work within an existing facility or have a limited budget. In any event, on a flat floor alternate the rows – don't ever place one chair directly behind another.

In classroom or instructional settings, fixed seating is not always desirable. Chairs in rows impede discussion and student interaction. It is a given fact that chairs arranged in a semi-circle stimulate interaction. If your shows are designed to provoke follow-up discussion, then serious consideration should be given to movable seating.

Since there is no one ideal seating arrangement, the best alternative is to arrange seating for the primary mode of usage.

Preparing the Audience for Your Presentation

Producers spend endless hours writing scripts, shooting slides, recording music, assembling, and programming their shows. These same producers spend little or no time at all in preparing or setting up their audience.

Any informal experiment will bear out the fact that audiences will gain a great deal more from a presentation if they are prepared for what they are about to see.

Audience preparation is extremely important if what they are to view is cognitive in content and emphasis. Audience preparation for multi-image viewing is somewhat analogous to the warm-up acts preceding the introduction of star entertainers on television. The star is supposed to be met with a sense of excitement and anticipation. Thus one or two short acts usually precede the star's entrance – what the broadcast audience is about to see is a reaction to something special. This same kind of feeling of anticipation can and should be built prior to the screening of a multi-image presentation. Tell your audience something about the show, but not so much as to give away a complete description.

One very common mistake that should be always avoided is the disclaimer. Never, never, never, apologize to the audience for what they are about to see – explain perhaps yes, apologize, never! If you do have to apologize, then you shouldn't be screening the presentation in the first place.

Techniques for preparing the viewers will vary with the audience and the type of show. Older audiences will generally need fuller explanation especially if the show is highly innovative and manipulates moods. First-time audiences need even greater explanation of what they are about to encounter in the technique of multi-image. Multi-image is still so new that many more people can be expected to be first-time viewers than repeaters.

Why Children Respond Well to Multi-Image

If the action is fast paced, most first-timers will find it difficult to follow. Younger first time viewers seem to have a natural bent for multi-image and are generally more accepting.

I have my own theories for this. Today's child grows up in a media-rich environment and is very much attuned to attending to more than one thing at one time. Children study with the stereo on or the TV on. Those of us who are older were taught to do and perceive one thing at a time. On the other hand, our children are not content to view long slow-paced shows. What they want is the fast-paced action that they've been conditioned to expect. Since today's children have grown up watching television, they have become sophisticated "visual experiencers." Most of a child's information is gained through the visual mode.

Children read far less today than they did a generation ago. Although television does employ verbal messages, the emphasis is always on the visual component. Multi-image is also highly visual and thus finds a natural and ready acceptance on the part of children. If the older generation is reluctant to embrace the medium of multi-image with less enthusiasm than their younger counterparts then look to television for an explanation.

For those of us over thirty-five, the world was linear and sequential when we grew up, because the books that we were exposed to were linear and sequential. One word followed another until meaning was established. Today's electronic environment is non-linear, non-sequential. It is largely simultaneous and multiple. We are bombarded by a multiplicity of stimuli from which we must make sense. We live in a world where "the visual is king."

This should be natural because we are able to process greater amounts of visual information then we are of verbal information.

For a while the new wave of non-linear films, plays, and teleplays swept over us with such intensity that a few voices were heard to cry out, "please just one story with a beginning, a middle, and an end." The experimentation in multi-image today is more in the hands of the technicians, the "button pushers," the "light freaks." The "button pushers" are more concerned with the "how to say" than the "what to say." Technique at the expense of content is the primary mode of far too many multi-image practitioners. Yet there are a few who have developed brilliant shows that offer far more via the multi-image medium than any other. These producers focus on content and are very concerned with message and meaning.

Tailor Your Audience Preparation to Program Content

If what you have to say is important and your show has content, then audience preparation is important. Multi-image can teach! If it is to be used for this purpose, you might want to develop a vocabulary list for your audience – the words can be gone over prior to the show. Important points should be brought out and stressed – let them know what to look for.

Should your show have an effective orientation then help establish the mood. Share your feelings with the audience. Give your audience some insight into why you think the show is important or significant. Give them a chance to relate to you on a more personal level.

Multi-image is an incredible, powerful medium for captivating and keeping the attention of both young and old. The show itself can be enhanced if you are willing to take a few minutes to prepare your audience.

After the show, any follow-up discussion might be difficult to initiate. This phenomenon is peculiar to multi-image. No research has yet been done to find out why audiences seem to refuse to express themselves. I suggest that it is due to phenomenon I call information overload. Since multi-image presents its information both in a simultaneous and rapid rate, overload will occur. As a result, the information that has been collected in the memory takes time to be processed. For first-time viewers, it might be best to delay any discussion of the presentation until another day. If this is not possible, then you must work hard to get the discussion going and even then one should not expect it to be substantive. I usually start off by asking for reactions. Once I receive some reply, I ask the responder to be more specific. In some cases I may give my reaction to a particular aspect in order to get them to react.

Follow-up is a good time to find out what about the program worked and what did not. In some cases you, the producer, might have made assumptions that just are not borne out. If this is so, then revision is called for. Probably the biggest failing on the part of producers that I know is their unwillingness to revise a show once it has been completed. Perhaps there is not enough emphasis on the revision aspect of production – there should be. The best shows usually undergo several revisions.

The Road Show

The time comes for all of us when someone writes or calls and invites us to come and bring our show. The producer, of course, is very flattered, even more so if someone is willing to pay for it. So we accept the invitation with visions of hundreds of applauding people dancing in our heads.

If you are like most of us, the first time you go on the road you go with a bunch of assumptions about the setting. Most probably, when you arrive on the scene, you find that all your assumptions are wrong. For example, the room you are to use has windows and the curtains let the light pass through, and you are scheduled for 6:00 p.m. that evening instead of 10:00 p.m. as originally planned. On further examination you discover the room has chandeliers that hang too low and will have to be tied up because you are using front projection. While trying to figure out where the electrical system is, the hotel manager informs you that the American Lead Pipe Manufacturers Association will be meeting on the other side of the electrical folding wall, and you will have to keep the sound very low and the lights on because the lights for both rooms are on the same circuit. After the manager leaves, the local AV dealer calls to tell you that the three additional ektagraphic slide projectors you had reserved for rental are not available. While desperately trying to locate another AV dealer that is open on Saturday, the conference leader interrupts to inform you that your show has been moved back another hour so that people will have something to see right after an early dinner. As if this isn't enough, the management insists that you move your car from the street in front of the hotel lobby – "you can park behind the building and unload there, but the front must be kept clear."

Upon returning from behind the building, the thought occurs to you that your show was put together for rear screen projection and you will have to turn every single slide around for front projection. Back at the conference room you discover that someone has tipped over tray number four and all the slides are on the floor and your script is in the suitcase that went on to Denver after you arrived in St. Louis. Your stomach is beginning to hurt so you decide to go to your room for Maalox. You arrive at your room – the message light is lit. You call down and find that one message is from your wife. She has finally decided to divorce you – don't bother to call. The other is from your finance company, they are going to re-possess your car – please call!!

Now all of this might seem somewhat of an exaggeration, however, I can assure you that many "roadshowers" have experienced more than one of these disasters.

Before You Go

Before starting out on the road, there are several precautions which can greatly lessen the probability of failure. The first and most important is to find out what the physical facilities will be like. Do not depend on a general description such as, "Well, I think there are three or four electrical outlets." Find out exactly how many, where they are located, and how much load they can power. Find out the exact size of the room and if there is any flat wall space. If the show is to be done during the daytime, make sure the room can be adequately darkened. Find out how many people are expected to watch the show. If the floor is flat, make sure you will be able to get tables for your equipment in order to project well over the heads of your audience. Ceiling height must also be determined because it is important for screen location; I usually carry a 9'x36' rolled paper screen, and then use one half of the 36' length, giving me a 9'x18' viewing area. I will not work on a smaller screen size because image reductions can greatly reduce the impact of the show. It is foolish to compromise one of the key elements of the multi-image medium.

If at all possible, attempt to visit the site prior to the show. This will allow you to make accurate room measurements for projector-to-screen throw distance, and more important, to check out the power circuits. Of course, this is not always possible. In that case, get as accurate a description of the facilities as is possible. Also, determine what equipment will be provided at the site. If your hosts will provide carousel projectors, find out what focal length lenses they have in case you need to provide your own.

Now it is time to inspect your own equipment. Check out your own projectors, if you will be taking them. Have you remembered spare lamps, and adapters? Clean and de-magnetize your recorder and make sure it is trouble free. If any of your cardboard mounted slides are dog-eared, remount them. Incidentally, if you are using 140 trays, think how you might eliminate them. Trays for 140 slides cause nothing but problems; if your projectors are tilted up or down, you will get hangups, and there is nothing worse than a hangup.

Sit down and make a list of all of the equipment and materials you are going to need. Be sure to remember spare lamps, spare blank slide mounts, masking tape, etc. When you are ready to pack, you can use this list to check everything off – this way you won't forget important items.

Setting Up

Set up time can be critical. Never agree to do a show where you will be allowed less than four hours to set it up. A good rule of thumb is that you have allowed enough set-up time when you're all ready to go an hour before the show. Then you have plenty of time to take care of any contingency. An example of this is what I encountered during a show I did a few years back. I had obtained what I thought was an accurate description of the physical facilities. When I arrived, I found the description accurate, except they forgot to mention the chandeliers. I had to have the hotel maintenance staff tie them up and that took time. But when five hundred people arrived, I was ready.

It Can Happen To You

Sooner or later you are going to experience equipment failure; most probably a lamp will blow during the show and when this happens, it can be "panicsville!" There is no way to avoid lamp failure unless you have a spare $300.00 for each projector for an automatic device that carries six lamps and requires just the flip of a switch to change lamps. The problem, however, is that all of your projectors must be modified to accept the gizmo. Multiply by six and you have just invested $1800.00 so that you can change a lamp in two seconds. Since very few of us have $1800.00 lying around, let's be a little more practical and replace every lamp before a truly important presentation, taking care to pre-burn them for 10 to 15 minutes after installation. If a lamp does blow during the show, your script is invaluable. Turn the tray to the 0 notch and remove it, pull the power plug and replace the lamp. Best use a glove or a handkerchief to handle the hot lamp. Force yourself to work slowly, because if you hurry you are apt to fumble and foul up. When you have replaced the lamp, power cord and tray, cue up to the next slide, and continue. Of course, it is quite likely that people will know you blew a lamp, but they are not going to boo you for it. It is a good idea to try out this emergency "fire drill" at home. You will be amazed at how skilled you can become!

Picture IX-7
Setting up well in advance of the showing.

AMI Collection

CHAPTER X
CRITICIZING THE PRESENTATION

Ken Burke

Communication and Criticism

Multi-image programs serve a variety of communicative purposes. Unfortunately, no schools of theory or criticism underlie the production of multi-image programs. There seems to exist no so-called "philosophical basis" for this form of communication. Perrin, writing in 1969, offered the only theory of multiple imagery to date. He said that simultaneous images on a large screen – or adjacent screens – create a pattern of information comparison and simultaneous visual montage; these visually-rich displays increase information density and seem to facilitate certain types of learning. No further elaborations on theories of multi-image communication have preceded the publication of this volume, nor have there been any critical methods suggested for application to multi-image programs.

One reason for the lack of critical statements may be the misconception of what constitutes a critical act. There are several types of practical critics, as opposed to scholarly critics or popular critics, who make vital decisions regarding multi-image programs. These practical critics include teachers, art directors, agency executives, and clients from various civic and governmental groups. Normally, they would not view themselves as critics; nevertheless, the results of their critical comments are directly applicable to the immediate value of specific multi-image programs. Such critical approval leads to good grades, agency acceptance or increases of salary. Critical rejection lead to the opposite. Thus, although the practical critic may not determine the historical worth of a message, as do scholarly critics, he or she does serve an important, pragmatic purpose in regulating the creation and use of multi-image programs. Except for some student projects, most practical criticism of multi-image programs occurs in a private session between producer and critic. Only after obtaining critical approval is the program shown to its intended audience.

Unfortunately, criticism of this type is totally individualistic and subjective since there exists no accepted system for criticizing multi-image programs. The purpose of this chapter is to offer a uniform system for multi-image criticism. In constructing such a system, it is proper to draw from existing schools of criticism and from existing knowledge about the uses of multi-image programs.

Functional/Experiential Criticism

Even if a particular school of analysis and evaluation is focused on the work of art itself, it is fair to say that the general concerns of practical criticism *and* scholarly criticism are *both* ultimately focused on the functional use that the message has for society or particular segments of society. Thus, it would seem proper to offer an overview of some systems of scholarly criticism in constructing a consistent method of practical criticism. Many of these systems are categorized in Figure X-1. The major schools of qualitative art criticism emerged during different centuries and are not really compatible in their emphases. Even the modern subdivisions that appear in Figure X-1 are firmly grounded in outlooks which cannot be reconciled into one total viewpoint.

Thus, while it is known that the various schools of scholarly criticism all offer some useful insights to the pracitical critic, none of them are ideally suited to the full situation of the multi-image program. The program itself should be examined, as in Objectivism; however, the functional purpose of the program and its potential effects on the audience should also be examined as in Pragmatism. Also, the expressive personality of the producer and the individual perceptions of the critic should appear in the account. It is quite necessary to consider the emotional response of the critic when constructing a system of criticism.

Emotional reactions may strengthen a critic's internal biases or misplace the critic's emphases which would hinder any attempt at objective

FIGURE X-1

Schools of Art Criticism

A. Type of Criticism:	Qualitative				Quantitative	
B. Focus:	nature, content	audience, style	artist, creative process	work of art, elements	linguistic structure	measureable social effects
C. Major School:	Mimesis	Pragmatism	Expressionism	Objectivism	Structuralism	Social Sciences
D. Some Subdivisions:	• Neo-Platonism • Expressive Symbolism	• Moral Criticism	• Psychological Criticism • Auteur Criticism	• Instrumentalist Criticism • Formalist Criticism • Semiotics	• Archetypal Criticism	• Sociological Criticism • Historical Criticism • Genre Criticism

Adapted from Abrams (1953), Adams (1971), Dickie (1973), Scott (1962), and Tudor (1973).

analysis. A critic must re-examine his or her reactions and be ready to re-evaluate judgments of value. The critic must try to balance feelings against observations. Every critic must be aware of one's responses, so as to minimize preconceptions. Taking all these considerations together, the critic should find her or himself examining: (1) the structure and style of a program, (2) the content of the program, (3) the potential value the program should have for a specific audience, and (4) the critic's own emotional reactions from observing the program.

The functional/experiential method of multi-image criticism is ultimately based on "phenomenology," which amounts to a description of primary interactions. Sender, receiver, message, and environment are the components of the total situation of communication. Interfacing between all these components must be accounted for when a complex channel of communication such as the multi-image program is involved. Functional examinations lead to analyses of the sender's intentions, the structure of the message, and the potential effects on the audience. Experiential observations emphasize the reaction of the perceiver and the influence of the environment. This environmental factor could refer to the creative influences acting on the producer, presentational influences acting on the critic, or the informational needs of the audience. This entire situation of multi-image communication should be examined in the process of practical criticism.

Functions of Communication

If a functional approach is taken to practical criticism of multi-image programs, there must be some clarifications of what functions any communication serves. The basic assumption is that these functions are somehow distinguishable. While any specific message probably uses elements from two or more functions, there is normally only one primary function being served. Thus, an informational program may use some persuasive techniques and some entertaining devices, yet remain essentially an informational experience.

In Figure X-2 the functions of communications are designated as information, instruction, persuasion, entertainment, and enrichment. (This designation derives from several writers on communication, especially Cavert (1974) and Schramm (1971).) Figure X-2 also includes the ideas of several writers concerning message types, functions, and purposes. (These specific message types are suggested by Wiebe (1971), while the message purposes are extrapolated from Carpenter (1973), Kaplan (1966), Lesswell (1971), and Wright (1959).)

One of the main characteristics that separates the various functions of communication is the applicability of quantitative measurement. For example, both instructional and persuasive messages can be measured on how well the specified goals are attained by the audience. Information is different from instruction and persuasion in that informational learning is not designed to be

FIGURE X-2

Types of Messages
as Related to the Functions of Messages

TYPE	ACTIVITY STRESSED	FUNCTION	PURPOSE
DIRECTIVE	awareness, attention comprehension	INFORMATION	surveillance
	acquisition and retention of data and skills	INSTRUCTION	cultural transmission
	yielding, acceptance, commitment	PERSUASION	correlation (politics, economics)
MAINTENANCE	stabilization, routine work and conversation	ENTERTAINMENT	ritual
RESTORATIVE	rebellion, vicarious sensory stimulation pleasure	ENTERTAINMENT	
	expression, rapture, meditation	ENRICHMENT	discovery

Adapted from the writings of Lasswell, Wright, Schramm, Cavert, Carpenter, Kaplan, and Weibe, as cited.

measured against a precise state of previous knowledge and behavior. McGuire (1973) notes that instruction and persuasion can be differentiated further: instruction stresses attention and comprehension while persuasion stresses yielding. As Schramm (1971) notes, entertainment is quite similar to instruction, information, and persuasion in having definite: 1) structural qualities, in that all these messages require encoding, attention-gathering, decoding, and suppression of noise; 2) immediate effects, in that each functional message is used for a specific purpose; and 3) long-term effects. Entertainment messages are valued for their immediate emotional impact on audiences, but these messages also provide some measurable affective results.

The long-term results of entertainment messages can be assessed, but since producers of entertainment seldom implant specific items into their messages which can be tested later, audience reaction can only be validly measured as a kind of general social learning. Such measurement constitutes more of a psychological study than a criticism of a message or an evaluation of its effectiveness.

Enrichment encompasses diverse and subtle ideas which could be called spiritual, ascribing to it a general "metaphysical" quality, rather than offering a specific religious experience. In its full sense, enrichment includes the aesthetic experience, artistic insight, intellectual discovery, meditative tranquility, religious ecstasy, romantic love, platonic love, sensuality, and passion. Enrichment includes experiencing the discoveries associated with the fine arts; entertainment, and on the other hand, encompasses all the ritualized, stimulation-centered activities of the popular arts. A closer examination, such as performed by Kaplan (1966), shows that enrichment emphasizes spontaneity, challenge, intensity, and other similar types of involvement.

An understanding of the differences between each of the five functions will aid the practical critic in evaluating a multi-image program. Programs and messages serving each function will display certain structural and content characteristics that are necessary to that function. Critics must view each program in its functional frame-work when judging whether it has successfully attained its expressed goal. Specific characteristics of each function are detailed in Figure X-3. One can find these by looking up Burke's Ref. (1976).

The statements in Figure X-3 are part of a five-page evaluation form proposed by the writer. In addition to functional evaluations, this form also contains statements on the format, style, techniques, and presentation environment of the program as well as statements on the critic's experiential reactions. Since a detailed description and explanation of this instrument is available elsewhere (Burke, 1976), only the one-page short form of the instrument is presented here in Figure X-4. However, more explanation will be given here about the philosophy behind these proposed critical instruments.

FIGURE X-3

Specific Evaluation Criteria for the Five General Functions of Communication

Information – Characterized by Specified Locales, Persons, Dates, and Activities

Contents are clear.
Repetition is used for clarity.
Perceptual capacity of the viewer is respected.
Potential "noise" is overcome by emphasis and clarity.

Instruction – Characterized by Explicit Learning Objectives

Validity of the contents can be tested.
Unit could integrate with other units of an instructional package.
Unit reflects general goals of the instructional institution.
Content is appropriate to the objectives.
Content is appropriate to the educational level of the intended audience.

Persuasion – Characterized by Arguments and Explicit or Implicit Conclusions

Program indicates that the producer is competent.
Style of the argument puts the audience into a receptive mood.
Organization of the argument is clear, logical, and conclusive.
Argument is appropriate to the audience.
Style is conducive to the conclusions of the argument.

Entertainment – Characterized by Predictable Structure and Conclusions

Program's theme is familiar.
Program's structure and development are predictable.
Conclusions are generally expected.
Ambiguity and challenge are mostly avoided.
Program emphasizes diversion, fun, or change from commonplace "reality."

Enrichment – Characterized by Stimulation of Thought, Contemplation, or Internal Awareness

Program uses ambiguity to maintain interest.
Treatment of the theme seems original.
Message elements or conclusions are somewhat unexpected.
Content is more affective than cognitive.

Evaluation Instruments

One way to focus subjective, practical criticism would be to construct a qualitative evaluation instrument, similar to instruments of scientific measurement. However, the attempt to organize and clarify responses must not lead to scoring critical opinion as if it were empirical testing. Critical opinions cannot be scored for numerical validity in the manner of quantitative measurement. Even though numerical values can be assigned to responses, and response items can be validly related to each other, any total score obtained on a critical instrument would be relative only to the specific critic using the instrument. Personal opinions simply cannot be numerically equated to universal values. However, a *qualitative* critical instrument would be useful and proper in helping to *organize* and *record* a critic's responses.

A proper qualitative critical instrument should guide the critic to take into consideration all the relevant aspects of a multi-image program. Based on the functional and experiential concerns examined in this chapter, relevant questions about multi-image programs would include: 1) what function does the program serve? 2) what evidence justifies this choice of function? 3) how well does the program serve a specific function? 4) what technical and stylistic standards does this program achieve? 5) what are the critic's emotional responses to the work? and 6) what is the perceived value of the program for its audience? A useful qualitative evaluation instrument would require the critic to respond to each of the above points. Figure X-4 is an example of the proposed evaluation instrument, presented in the form of a summary checklist of the above ideas.

FIGURE X-4

Multi-Image Evaluation Instrument, Short Form

Where previewed: Date:

Name of Producer:

Title of Program:

At the beginning of the program what did you perceive to be the function of the program: (circle)

INFORMATION INSTRUCTION PERSUASION ENTERTAINMENT ENRICHMENT

Was that impression confirmed at the end of the program: Yes No

If not, what did the function seem to be at the end of the program:

INFORMATION INSTRUCTION PERSUASION ENTERTAINMENT ENRICHMENT

Respond to the following statements by assigning a value in one of the five appropriate blanks.

strongly agree		not certain		strongly disagree	
					The program's function was clear over 50% of the time.
					The total experience of the program affirms the perceived function.
					The program's structure enhances the function.
					The style and technique of the program enhance its function.
					Technical quality of the visuals (exposure, focus) is excellent.
					Technical quality of the sound track (levels, lack of distortion) is excellent.
					The presentation environment (light level, visibility, image size, screen positioning, audio volume) is excellent.
					Aesthetic quality of visuals (composition, sequencing) is excellent.
					Aesthetic quality of the sound (variety, editing) is excellent.
					This program held my attention over 50% of the time.
					This program aroused feelings in me that seem to support its primary function.
					This program has high value for the (presumed) intended audience.

Comments (including suggestions for revision):

Overall rating:

superior above average average below average inferior

REVIEWER:

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When using an instrument for criticism, such as the one presented here, the critic should be aware of certain concepts which will clarify the statements on the instrument. Foremost among such considerations is the idea that both the critic and producer have the goal of achieving a successful multi-image program. Thus, there should be a concentration on cooperation and full explication of the program in question. The producer cooperates by specifying all of the presentational data before the preview showing of the program. Function, title, running time, number of image areas (screens or areas on a large screen), number of audio channels, number of slide and movie projectors used, number of dissolve units used, and type of automated programmer used are among the items which the producer should specify to the critic. If the critic knows this information before viewing the program, he should be more aware of how a program's format enhances the total presentation.

How a multi-image program is conceptualized will often determine the final clarity and effectiveness of the message. The number of image areas and orientation of these areas, as well as mechanical considerations such as the arrangement of the loud speakers can all affect the total comprehensibility of a program. This does not imply that multi-image programs are required to have a specified one, two, or three image areas, nor is it necessary to have the loud speakers placed near the screens. Some program content might lend itself to cruciform (or X-shaped) formats; some content might be best delivered to the accompaniment of a quadraphonic sound track flooding the audience's entire aural environment. Similarly, image size can be determined by design considerations. Some ideas would be far better explored if one large image area were used for topic statement and smaller images areas were used for supplementary information. Pacing, sequencing, and overall length must also be appropriate to the program. Pacing should be slow enough to assure comprehension yet fast enough to sustain attention. Length should not exceed the time necessary to present and elaborate the message.

Reinforcement and juxtaposition of images and sounds can be used for such divergent purposes as clarity and irony. The redundancy of image and sound is very effective for attaining clarity, especially when related sound and visual cues are combined in the message. In addition, message elements can be used metaphorically to add further levels of meaning to a presentation. Verbal descriptions of farms accompanied by pictures of farms, farmers, and produce would be an example of audio-visual redundancy. Verbal descriptions of American crop surpluses accompanied by pictures of food and feasting suburbanites, contrasted to images of starving ghetto dwellers would be an example of multi-image juxtaposition used for ironic impact. Similar contrast in audio-visual juxtaposition would result when a soundtrack describes the rigors of a job while the accompanying images show a person loafing. Any of these structural devices may be used to enhance a message, but in any program some devices will be more effective than others. It is, however, worth nothing that little is more tedious than *obvious* redundancy – if the visuals include any text or text passages, having a narrative track that reads this text would constitute a very undesirable example of the reinforcement of sound and visuals.

Technical and aesthetic considerations about a program are often the most troublesome concepts for a practical critic. Those critics who are not producers themselves often do not feel competent to judge the production aspects of a program. An evaluation instrument can provide little help in gaining technical knowledge that a critic does not already possess. Learning about the production techniques will help, but only practice as a producer and judge can sharpen a critic's eyes and ears. Possibly the simplest distinction is that to be made between technically *recording* the images and sounds and aesthetically *arranging* these same images and sounds.

Thus, technical quality of the visual element requires sharp focus and proper lighting of the pictorial subjects. Technical quality of the audio element necessitates the recording and reproduction of the sounds with consistent volume levels with minimal signal distortion and background noises, and avoidance of any machine "clicks" and "hiss."

On the other hand, the aesthetic quality of the visual element depends on obtaining interesting composition and arrangement of the shapes, lines, and colors so as to lead the viewer directly to the content the producer wishes to emphasize. Such design considerations are necessary for both each individual image as well as for the composite arrangement of the multiple images. An aesthetically pleasing arrangement of the soundtrack includes imaginative choice of narrative or singing voices, the use of novelty as well as variety, the skillful editing and juxtaposition of the components and the trenchant use of silence. Sequencing of one sound after another, controlling the transitions between sounds, and assuring a proper balance between background and foreground sounds are all part of an aesthetic evaluation of a sound track.

Even if the soundtrack is simply one pre-recorded commercial musical offering, one can still comment on the aesthetic quality on how well the program producer has succeeded in living with his or her constraints and in making the visuals fit the given sound. In such a choice, the critic is free to minimize his or her comments on the aesthetic merit of the given sound track and concentrate instead on what was done with it. A similar situation occurs when the visuals are given to the producer as an accomplished fact such as when they are copies of commercial photographs or advertisements. Here again, the emphasis should be placed on the producer's technical skill manipulating the giver and in not degrading the quality of the original artwork.

Still another concern is the setting for the presentation. The producer and the person in charge of the presentation must provide: proper sightlines to the screens, images large enough to be seen by the most distant viewers, an ambient light level low enough to assure image clarity (but possibly high enough to allow note taking, where this is required) and a soundtrack loud and distortion-free enough to be heard clearly. Failure with any of these considerations could result in external noise sufficient to block the transmission of the intended message.

It is important to note that the private preview session offered to the critic may not be in the kind of optimum location as will be in the actual presentation. When this constraint is imposed, these environmental considerations must be taken into consideration and ultimate criteria cannot be evaluated adequately in the preview context. Still, the producer must demonstrate that he or she is aware of these presentational requirements and has incorporated them into the design of the program.

A final critical consideration relates to the basic nature of multi-image programs: these programs are composed of restructured time but they are nonetheless presented in actual clock time. Slides freeze actions and environments, allowing space and time to be seemingly re-arranged at will, especially in the multi-image format. Similarly, motion picture film is normally arranged into restructured time through judicious editing; similarly the sound track is also an edited, artificial, and manipulated product. Yet, this reconstructed, or "unreal" multi-image world is presented to the viewers in the real operational time of tape recorders and slide projectors. The critic should be aware of the inherent limitations of a medium where tape playback speeds, rotating slide trays, and advancing punch paper tape restrain even the most sophisticated automated programmer. A virtually miraculous mechanical ballet occurs when presentation technology is respected and used within its natural limitations. Therefore, the critic should not carp about noticeable slide changes, machine noises, and slight projection distortion ("keystoning") as inherent in this and only try to determine whether any discrepancies exceed an expected "norm." These minor inconveniences are going to occur whenever multi-image programs are presented in spaces which were not designed for such technical complexity. Consequently, mechanical distractions should be noted with disfavor only if they are significantly excessive.

A comprehensive evaluation instrument, even one as brief as Figure X-4, should cover functional evaluation, judgments or technical, aesthetic, an presentational qualities, and recognition of the emotional reactions of the critic. These experiential emphases are intended to guide the critic's internal examination of his feelings and reactions. It is hoped that concentration on these aroused feelings will clarify to the critic how his emotions affect his attention span and his evaluative judgments.

A Final Reminder

The scholarly critic determines the historical worth of a message. The scientific evaluator measures the effectiveness of a message. The practical critic makes an immediate personal judgment that affects the eventual use of a message. Practical critics are the necessary arbiters between producers and audiences. Through informed, responsible actions by such critics, audiences will benefit by receiving programs that are understandable, attractive, useful, and highly enjoyable.

Appendix A

Manufacturers of Program Control Devices

Programmers

As discussed in the chapter on Programming the Presentation, the so-called "programmers" are devices for generating and playing back projector (and other device) controlling information. Usually, a device qualifies as a programmer if it is capable of making more than two different sequential events take place. The higher-priced modern programmers can frequently cause dozens of different events to take place.

Programmers generally differ from synchronizers and dissolve units which usually do not include both signal generation and playback capabilities. However, as with most things, there are exceptions.

The list of manufacturers is a partial one since many new firms periodically enter and withdraw from the market. The way to use all of the following listings is to pick out names one finds somehow familiar and make inquiries for product literature. If the literature indicates that further pursuit of the item is in order, many manufacturers are glad to set up some kind of a demonstration or even a hands-on try-out of their equipment.

Arion Corporation
825 Boone Ave. North
Minneapolis, Minnesota 55427
(612) 544 8622

Audio-Sine Inc.
3415 48th Ave. North
Minneapolis, Minnesota 55429
(612) 537 8127

Audio Visual Laboratories Inc.
420 Highway 36
Belford, N. J. 07718
(201) 291 4404

AVTEK
28 Woodard Rd.
Walpole, Massachusetts 02081
(617) 668 6633

Bergen Expo Systems Inc.
1088 Main Avenue
Clifton, N.J. 07011
(201) 472 1154

Clear Light Productions Inc.
P. O. Box 391, 57B Chapel St.
Newton, Massachusetts 02158
(617) 969 3456

Columbia Scientific Industries Inc.
AVC Division
P. O. Box 9908, 11950 Jollyville Road
Austin, Texas 78766
(512) 926 1530

Dukane Corporation
2900 Dukane Dr.
St. Charles, Illinois 60174
(312) 584 2300

EEG Enterprises Inc.
82 Rome St.
Farmingdale, N.Y. 11735
(516) 293 7472

Electrosonic Systems Inc.
4575 W. 77th St.
Minneapolis, Minnesota 55435
(612) 835 5787

Fortune Audio-Visual
35 Bergan Tpke.
Little Ferry, N.J. 07643
(201) 440 2888

Impact Communications Inc.
P. O. Box 28639
Dallas, Texas 75228
(214) 327 9066

Intermedia Systems Corporation
711 Massachusetts Ave.
Cambridge, Massachusetts 02139
(617) 868 9880

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The Klitten Company
1221 Ocean Avenue
Santa Monica, California 90401
(213) 395 5342

Mackenzie Laboratories Inc.
P. O. Box 3085, 5507 N. Peck Road
Arcadia, California 91006
(213) 579 0440

Modern Media
Rt. 3, Box 748
Apache Junction, Arizona 85220
(602) 986 0702

Montage Productions Inc.
9 Industrial Drive
Rutherford,N.J. 07070
(201) 935 5060

Motiva Ltd.
18 E. 50th St., 8th Floor
New York, N.Y. 10022
(212) 826 0920

Radmar Inc.
1282 Old Skokie Road
Highland Park, Illinois 60035
(312) 831 9000

Spindler & Sauppe Inc.
13034 Saticoy St.
North Hollywood, California 91605
(213) 764 1800

Technamics Company
2232 Gardner Station
St. Louis, Missouri 63109
(314) 832 9640

United Audio Visual Corp.
1730 Mojave Road
Las Vegas, Nevada 89104
(702) 457 8612

Wollensak /3M Company
Bldg. 223-5E, 3M Center
St. Paul, Minnesota 55101
(612) 733 9627

Synchronizers

A synchronizer may be as simple as the familiar old Kodak black box which translated the slide advance signal from the Carousel's remote control into a recordable sound which it then could retranslate during playback into a slide advance. More sophisticated Synchronizers are based in cassette recorders and provide the synchronizing circuitry internally to the recorder. Several such units have "expanded" to where they now too can control two separate projectors simultaneously and are thus encroaching into the category of programmers.

Electronic Systems Inc.
4575 W. 77th St.
Minneapolis, Minnesota 55435
(612) 835 5787

General Techniques Inc.
1270 Broadway
New York, N.Y. 10001
(212) 524 2557

Impact Communications Inc.
P. O. Box 28639
Dallas, Texas 75228
(214) 327 9066

The Klitten Company
1221 Ocean Avenue
Santa Monica, California 90401
(213) 395 5342

Optisonics HEC Corporation
1802 W. Grant Road
Tucson, Arizona 85705
(602) 792 1040

Philips Audio Video Systems Corporation
16 McKee Drive
Mahwah, N.J. 07430
(201) 529 5900

Radmar Inc.
1282 Old Skokie Road
Highland Park, Illinois 60035
(312) 831 9000

Sight & Sound Systems
5619 St. John Ave.
Kansas City, Missouri 64123
(816) 483 4612

Spindler & Sauppe Inc.
13034 Saticoy St.
North Hollywood, California 91605
(213) 764 1800

Teaching Dynamics Inc.
4441 Main St.
Philadelphia, PA 19127
(215) 482 7660

Pulse Generators

A pulse generator is a one-way device. It can produce either programming or synchronizing signals but cannot detect them during playback. Pulse generators must be used in conjunction with a compatible playback unit. Their chief advantage *is that they allow the producer to work directly* with sophisticated reel-to-reel recorders (that do not have any internal pulse generation capability) for the development of master tapes from which later on cassettes may be mass reproduced for use with lower-priced cassette playback units.

American Professional Equipment Co.
2802 S. MacDill Ave.
Tampa, Florida 33609
(813) 839 5374

AVID Corporation
10 Tripps Lane
East Providence, R.I. 02914
(401) 438 5400

Charles Beseler Company
8 Fernwood Road
Florham Park, N.J. 07932
(201) 822 1000

Electronic Systems Inc.
4575 W. 77th St.
Minneapolis, Minnesota 55435
(612) 835 5787

Philips Audio Video Systems
Corporation
16 McKee Drive
Mahwah, N.J. 07430
(201) 529 5900

Radmar Inc.
1282 Old Skokie Road
Highland Park, Illinois 60035
(312) 831 9000

Spindler & Sauppe Inc.
13034 Saticoy St.
North Hollywood, California 91605
(213) 764 1800

Tapeheads
4020 Beecher St. NW
Washington, D.C. 20007
(202) 338 6510

Dissolve Controls

The simplest dissolve control has a fixed rate of inversely varying the voltage directed to each of two projector lamps. When the lamp in one projector has been "turned all the way down," then the slide in that projector is advanced. Such dissolve units respond to only one incoming control signal – so as to initiate each half of a repeated back and forth dissolve cycle.

More sophisticated dissolve systems can control more than two projectors, have either several discrete different dissolve rates, or may even offer *a continuously variable and even reversible dissolve* rates. Many maintain the "off" projector's lamp at a low pre-heated condition to substantially increase lamp life. A few include dissolve signal generation and playback circuitry and consequently again overlap into the programmer category.

Usually, dissolve units are used as the power-handling interface between the programmer as synchronizer and the projectors. Thus although a presentation would be controlled by one programmer, it in turn may regulate many dissolve units – usually half as many as there are projectors.

Note that electronic dissolve units are suitable for controlling only the outputs of filament lamps. When using extremely high-powered arc-lamp illuminated projectors, it is necessary to resort to mechanical dissolve units such as those distributed by Leitz in Europe or available as built in features with some arc-illuminated auditorium projector systems.

Arion Corporation
825 Boone Ave. North
Minneapolis, Minnesota 55427
(612) 544 8622

Audio Visual Laboratories Inc.
420 Highway 36
Belford, N.J. 07718
(201) 291 4404

AVTEK
28 Woodard Road
Walpole, Massachusetts 02081
(617) 472 1154

Bergen Expo Systems Inc.
1088 Main Avenue
Clifton, N.J. 07011
(201) 472 1154

Buhl Optical Co.
1009 Beech Ave.
Pittsburgh, PA 15233
(412) 321 0076

Clear Light Productions Inc.
P. O. Box 391, 57B Chapel St.
Newton, Massachusetts 02158
(617) 969 3456

Columbia Scientific Industries Inc.
AVC Division
P. O. Box 9908, 11950 Jollyville Road
Austin, Texas 78766
(512) 926 1530

EEG Enterprises Inc.
82 Rome St.
Farmingdale, N.Y. 11735
(516) 293 7472

Eastman Kodak Company
343 State St.
Rochester, N.Y. 14650
(716) 724 4689

Electronic Systems Inc.
4575 W. 77th St.
Minneapolis, Minnesota 55435
(612) 835 5787

Impact Communications Inc.
P. O. Box 28639
Dallas, Texas 75228
(214) 327 9066

Montage Productions Inc.
9 Industrial Drive
Rutherford, N.J. 07070
(201) 935 5060

E. Leitz Inc.
Link Drive
Rockleigh, N.J. 07647
(201) 767 1100

Mackenzie Laboratories Inc.
P. O. Box 3085, 5507 N. Peck Road
Arcadia, California 91006
(213) 579 0440

Optisonics HEC Corporation
1802 W. Grant Road
Tucson, Arizona 85705
(602) 792 1040

RMF Products Inc.
P. O. Box 413
Batavia, Illinois 60510
(312) 898 4571

Sight & Sound Systems
5619 St. John Ave.
Kansas City, Missouri 64123
(816) 483 4612

Skirpan Lighting Control Corp.
61-03 32nd Ave.
Woodside, N.Y. 11377
(212) 274 7222

George R. Snell, Associates Inc.
155 U. S. Route 22
E. Springfield, N.J. 07081
(201) 467 2666

Spindler & Sauppe Inc.
13034 Saticoy St.
North Hollywood, California 91605
(213) 764 1800

Technamics Company
2232 Gardner Station
St. Louis, Missouri 63109
(314) 832 9640

Technicraft Division
Jackson Industries Inc.
P. O. Box 9098, 405 Greenlawn Dr.
Columbia, S.C. 29290
(803) 776 7000

Tempo Audivision Inc.
290 Larkin St.
Buffalo, N.Y. 14210
(716) 855 2032

3M Brand Polacoat Products
Visual Products Division
Bldg. 220-10W, 3M Center
St. Paul, Minnesota 55101
(612) 733 7001

United Audio Visual Corp.
1730 Mojave Road
Las Vegas, Nevada 89104
(702) 457 8612

Wollensak /3M Company
Bldg. 223-5E, 3M Center
St. Paul, Minnesota 55101
(612) 733 9627

Appendix B

Manufacturers of Audio Recording and Playback Equipment

Reel-to-Reel Recorders

Even though more and more consumers are switching to use cassette recorders, the reel-to-reel recorder remains the producer's main audio manipulation tool. This is not necessarily because the reel-type recorder offers that much finer fidelity (many cassette decks offer superb audio fidelity) but rather because reel-to-reel recordings may be recorded and re-recorded one track at a time. This is impossible with all but the specially designed synchronizer cassette units. Also, cut and splice editing remains the favorite of many who assemble sound tracks and doing so with cassette tape is outrageously difficult.

Also, more and more big production multi-image presentations rely on stereo or even three-channel sound tracks – this is attainable only with quadraphonic recorders, another feature not available on cassette recorders.

Ampex Corporation
401 Broadway
Redwood, California 84063
(415) 367 4161

Arriflex Company of America
25-20 Brooklyn-Queens Expressway, West
Woodside, N.Y. 11377
(212) 932 2403

Crown International Inc.
1718 Mishawaka Rd.
Elkhart, Indiana 46514
(219) 294 5571

GEL Systems, Inc.
1085 Commonwealth Ave.
Boston, Massachusetts 02215
(617) 783 0460

Otari Corporation
981 Industrial Road
San Carlos, California 94070
(415) 593 1648

Nagra Magnetic Recorders Inc.
1147 N. Vine Street
Hollywood, California 90038
(213) 469 6391

Philips Audio Video Systems Corp.
16 McKee Drive
Mahwah, N.J. 07430
(201) 529 5900

Revox Corporation
155 Michael Dr.
Syosset, N.Y. 11791
(516) 364 1900

SONY
Distributed by Superscope Inc.
8150 Vineland Ave.
Sun Valley, California 91352
(213) 767 9750

Tandberg of America Inc.
Labriola Court
Armonk, N.Y. 10504
(914) 273 9150

TEAC Corp. of America
P. O. Box 114, *155 Murray St.*
Rochester, N.Y. 14601
(213) 726 0303

Telex Communications Inc.
9600 Aldrich Ave.
South Minneapolis, Minnesota 55420
(612) 884 4061

Wollensak /3M Company
Bldg. 223-5E, 3M Center
St. Paul, Minnesota 55101
(612) 733 9627

The cassette recorder, or deck, offers the great advantage of compact size, lighter weight, and to some extent lesser vulnerability when pummelled about. Stereo cassette decks – if of a high enough quality to assure adequate channel separation to minimize "cross-talk" between channels – can be used to play back monaural soundtracks with the other channel carrying the program control signals.

However, cassette machines are suitable only for the playback aspect of a production – the assembly of the composite audio and control signal tape is still best done using reel-to-reel equipment. When this product is satisfactorily complete it can then be duplicated onto stereo cassettes for playback "in the field."

Also, battery operated, highly portable cassette recorders are ideal for field recording of sound material for use with documentary style multi-image productions. Many superior quality portable stereo cassette recorders are presently available and offer quality nearly equivalent to that attainable with professional reel-type portables (such as the Nagra or Shellavox) costing three to five times more.

With the advent and expected further developments in the new ¼-inch Elcaset cassette format, much greater use of such cassette units can be expected in the multi-image production.

Akai America Ltd.
2139 E. Dal Amo Blvd.
Compton, California 90220
(213) 537 3880

Audiotronics Corporation
P. O. Box 3997, 7428 Bellaire Avenue, N.
Hollywood, California 91609
(213) 765 2645

Avedex Inc.
7326 N. Niles Center Road
Skokie, Illinois 60076
(312) 679 8210

AVID Corporation
10 Tripps Lane
East Providence, R.I. 02914
(401) 438 5400

Califone International Inc.
5922 Bowcroft St.
Los Angeles, California 90016
(213) 870 9631

Hitachi Sales Corp. of America
401 W. Artesia Blvd.
Compton,CA
Compton, CA 90220
(213) 537 8383

Nakamichi Research (USA) Inc.
220 Westbury Ave.
Carle Place, N.Y. 11514
(516) 333 5440

Newcomb Audio Products Co.
12881 Bradley Ave.
Sylmar, California 91342
(213) 367 1921

Telex Communications Inc.
9600 Aldrich Ave.
South Minneapolis, Minnesota 55420
(612) 884 4061

Panasonic Systems
P.O. Box 3980
Grand Central Station
200 Park Avenue
New York, N.Y. 10017
(212) 973 5700

SONY
8150 Vineland Ave.
Sun Valley, CA 91352
(213) 767 9750

V-M Corporation
P. O. Box 1247
Benton Harbor, Michigan 49022
(616) 925 8841

Wollensak /3M Company
Bldg. 223-5E, 3M Company
St. Paul, Minnesota 55101
(612) 733 9627

Cassette Recorders with Built-in Synchronizers

As mentioned under the discussion of synchronizers, there are many cassette recorders available which already incorporate internal circuitry for synchronizing a slide presentation to a sound track. The internal circuitry is both the greatest virtue as well as drawback to many such devices. It is a virtue since it offers simplicity of operation, it is a disadvantage since most units do not provide electronic access to the control track, thus restricting use to the specific unit in hand. The usual control output of such units consists of an internal switch closure, thus the output consists of a momentarily shorted circuit. This is ideal for advancing slides in a projector.

As indicated, many of these units offer additional control signals, thus it is possible to "program" them to stop automatically at specific points – this is very useful for individualized use of preprogrammed productions. Some recorders also provide two different outputs allowing for the control of either two projectors or four projectors coupled through two dissolve units.

Audio Visual Dynamics Inc.
92 Stuyvesant Avenue
Newark, N.J. 07106
(201) 371 3535

Audio-Visual Specialty Products (AVSP)
6061 W. 3rd St.
Los Angeles, California 90036
(213) 939 1185

Audiotronics Corporation
P. O. Box 3997, 7428 Bellaire Ave. N.
Hollywood, California 91609
(213) 765 2645

AVID Corporation
10 Tripps Lane
East Providence, R.I. 02914
(401) 438 5400

AVTEK
28 Woodard Road
Walpole, Massachusetts 02081
(617) 668 6633

Beacon Camera Division
Whitehouse Products Inc.
360 Furman St.
Brooklyn, N.Y. 11201
(212) 615 3570

Califone International Inc.
5922 Bowcroft St.
Los Angeles, California 90016
(213) 870 9631

Dukane Corporation
1900 Dukane Drive
St. Charles, Illinois 60174
(312) 584 2300

Educational Electronics of California Inc.
213 N. Cedar Avenue
Inglewood, California 90301
(213) 677 8167

Electrosonics Systems Inc.
4575 W. 77th St.
Minneapolis, Minnesota 55435
(612) 835 5787

Montage Productions Inc.
9 Industrial Drive
Rutherford, N.J. 07070
(201) 935 5060

Optisonics HEC Corp.
1802 W. Grant Rd.
Tucson, Arizona 85705
(602) 792 1040

Telex Communications Inc.
9600 Aldrich Ave.
South Minneapolis, Minnesota 55420
(612) 884 4061

Tempo Audivision Inc.
290 Larkin St.
Buffalo, N.Y. 14210
(716) 855 2032

V-M Corporation
P. O. Box 1247
Benton Harbor, Michigan 49022
(616) 925 8841

Wollensak /3M Company
Bldg. 223-5E, 3M Center
St. Paul, Minnesota 55101
(612) 733 9627

Appendix C

Manufacturers of Related Equipment

8mm and 16mm Motion Picture Projection Equipment

Motion picture projectors are the old standbys for instructional use. The biggest recent innovation is the introduction of the super-8 format. If very professionally photographed, these films are occasionally of good enough quality to be interspersed into multi-image productions. However the great discrepancy in screen illumination levels between 8mm and 35mm material makes the 16mm format the better option.

Note that 16mm and 35mm projections do not have the same aspect ratios. Thus, if your use calls for exactly matching the 16mm presentation into your slide format inquire with your distributor regarding possible modifications to the film "gate" so as to obtain the typical 2:3 aspect ratio characteristic of 35mm slides.

It is obviously desirable to look for reliability, but it also helps to consider ease of remote controlling and brightness of projected image when making the selection.

ELMO Mfg. Corp.
32-10 57th St.
Woodside, N.Y. 11377
(212) 626 0150

Eumig (U.S.A.) Inc.
Lake Success Business Park
225 Community Drive
Great Neck, N.Y. 10011
(516) 466 6533

Kalart Victor Corp.
P. O. Box 112, Hultenius St.
Plainville, Connecticut 06062
(203) 747 1773

Singer Educational Systems
3750 Monroe Avenue
Rochester, N.Y. 14603
(716) 586 2020

Viewlex Audio Visual Inc.
1 Broadway Avenue
Holbrook, L.I., N.Y. 11741
(516) 589 6600

Automatic Slide Projectors

By automatic projectors one means those in which an automatized mechanism changes the slides, thus allowing for remote control. The old standby for most U.S. users is the Kodak Carousel. However, it is by no means the only possible projector. There are many quality automatic slide projectors available besides the Kodak, a few cost less, most sell for far higher prices. In addition, there exist several modifications of the Kodak machine, done to increase light output, to change the illumination characteristics, or even to speed up the change rate.

Some alternatives to the Carousel offer a far cooler environment for the slide, some enable the continuous sequential showing of far more slides than possible with the Carousel's 140 slide tray and many offer greater edge-to-edge brightness on the screen.

In addition to alternative projectors, many manufacturers offer accessories for the Carousel, such as special lenses not available from Kodak.

Buhl Optical Company
1009 Beech Avenue
Pittsburgh, PA 15233
(412) 321 0076

Eastman Kodak Company
343 State Street
Rochester, N.Y. 14650
(716) 724 4689

Fortune Audio-Visual
35 Bergen Turnpike
Little Ferry, N.J. 07643
(201) 440 2888

GAF Corporation
A-V Products Division
140 W. 51st St.
New York, N.Y. 10020
(212) 582 7600

GAVI-GEN Audio-Visual Inc.
306 Hempstead Ave.
Malverne, N.Y. 11565
(516) 887 2825

Optical Radiation Corp.
6352 N. Irwindale Ave.
Azuza, California 91702
(213) 969 3344

Spindler & Sauppe Inc.
13034 Saticoy St.
North Hollywood, California 91605
(213) 764 1800

Tempo Audivision Inc.
290 Larkin St.
Buffalo, N.Y. 14210
(716) 855 2032

Sound Slide Projectors

Standard Projector & Equipment Co. Inc.
3070 Lake Terrace
Glenview, Illinois 60025
(312) 729 4200

Teaching Dynamics Inc.
4441 Main St.
Philadelphia, PA 19127
(215) 482 7660

3M Company
Visual Products Division
Bldg. 220-10W, 3M Center
St. Paul, Minnesota 55101
(612) 733 7001

Emde Products Inc.
2040 Stoner Avenue
West Los Angeles, California 90025
(213) 272 7394

Heindl Masks 'N' Mounts
200 St. Paul Street
Rochester, N.Y. 14604
(716) 454 5080

Eastman Kodak Company
343 State St.
Rochester, N.Y. 14650
(716) 724 4689

Visual Horizons
208 Westfall Road
Rochester, N.Y. 14620
(716) 442 3600

Wess Plastic
59 Schmitt Blvd.
Farmingdale, N.Y. 11735

Slide Mounts and Masks

Slide Making and Duplicating Services

E. Leitz Inc.
Link Drive
Rockleigh, N.J. 07647
(201) 767 1100

Oxberry Division
Richmark Camerica Service Inc.
517 Timpson Place
Bronx, N.Y. 10455
(212) 585 0730

Slidemagic System
2040 State Highway 35
Wall, N.J. 07719
(201) 449 3826

Stokes Slide Services
7000 Cameron Road
Austin, Texas 78752
(512) 458 2201

Talijon Inc.
P. O. Box 315
Woodmere, N.Y. 11598
(516) 569 6884

Slide Handling Equipment

Cabinets

Elden Enterprises Inc.
P. O. Box 3201
Charleston, W.V. 25332
(304) 344 2335

Leedal Inc.
2929 S. Halsted
Chicago, Illinois 60608
(312) 842 6588

Luxor Corporation
P. O. Box 830
104 Lake View Ave.
Waukegan, Illinois 60085
(312) 244 1800

Multiplex Display Fixture Company
1555 Larkin Williams Road
Fenton, Missouri 63026
(314) 343 5700

Neumade Products Corp.
P. O. Box 568
720 White Plains Road
Scarsdale, N.Y. 10583
(914) 725 4900

Light Tables

Leedal Inc.
2929 S. Halsted
Chicago, Illinois 60608
(312) 842 6588

Folders

Plastic Products Inc.
P. O. Box 1118
1822 E. Franklin St.
Richmond, Virginia 23208
(804) 644 2355

Plastic Sealing Corporation
1507 N. Gardner St.
Hollywood, California 90046
(213) 876 0062

Binders

Seary Manufacturing Corp.
19 Nebraska Avenue
Endicott, N.Y. 13760
(607) 748 7478

Wess Plastic
50 Schmitt Blvd.
Farmingdale, N.Y. 11735
(516) 293 8994

Projection Lenses

Buhl Optical Company
1009 Beech Avenue
Pittsburgh, PA 15233
(412) 321 0076

Projection Screens

Audio Visual Promotion Aids, Inc.
Room 815, 466 Lexington Ave.
New York, N.Y. 10017
(212) 679 4080

The George F. Cram Company Inc.
P. O. Box 426
301 S. LaSalle St.
Indianapolis, Indiana 46206
(317) 635 5564

Eastman Kodak Company
343 State St.
Rochester, N.Y. 14604
(716) 454 5080

Da-Lite Screen Company Inc.
P. O. Box 629
Warsaw, Indiana 46580
(219) 267 8101

Draper Shade & Screen Company
411 S. Pearl St.
Spiceland, Indiana 47385
(317) 987 7999

Knox Manufacturing Company
111 Sprice St.
Wood Dale, Illinois 60191
(312) 595 0300

Projection Tables and Stands and Racks for Alignment

American Professional Equipment Company
2802 S. MacDill Avenue
Tampa, Florida 33609
(813) 839 5374

Audio Visual Contractors Company
6875 E. Evans
Denver, Colorado 80222
(303) 758 4242

Buhl Optical Company
1009 Beech Avenue
Pittsburgh, PA 15233
(412) 321 0076

Columbia Scientific Industries Inc.
AVC Division
P. O. Box 9909, 11950 Jollyville Road
Austin, Texas 78766
(512) 926 1530

Fortune Audio-Visual
35 Bergen Turnpike
Little Ferry, N.J. 07643
(201) 440 2888

RMF Products Inc.
P. O. Box 413
Batavia, Illinois 60510
(312) 898 4571

Welt/Safe-Lock Inc.
2400 W. Eighth Lane
Hialeah, Florida 33010
(305) 885 6401

Audio Mixers

Lear Siegler Inc.
Bogen Division
P. O. Box 500
Paramus, N.J. 07607
(201) 343 5700

Shure Brothers Inc.
222 Hartrey Avenue
Evanston, Illinois 60204
(312) 328 9000

Sony Corporation of America
8150 Vineland Avenue
Sun Valley, California 91352
(213) 767 9750

Audio Tape Duplicators

Audio/Tek Inc.
P. O. Box 5012
San Jose, California 95150
(408) 378 5586

Cetec Audio Inc.
13035 Saticoy St.
North Hollywood, California 91605
(213) 875 1900

Dukane Corporation
2900 Dukane Drive
St. Charles, Illinois 60174
(312) 584 2300

Infonics Inc.
P. O. Box 1111
238 Highway 212
Michigan City, Indiana 46360
(219) 879 3381

Pentagon Industries Inc.
4651 N. Olcott Avenue
Chicago, Illinois 60656
(312) 867 9200

Recordex Corporation
1300 Booth Avenue NW
Atlanta, Georgia 30318
(404) 351 7062

Telex Communications Inc.
9600 Aldrich Ave.
South Minneapolis, Minnesota 55420
(612) 884 4061

Wollensak /3M Company
Bldg. 223-5E 3M Center
St. Paul, Minnesota 55101
(612) 733 9627

Appendix D

Sources of Information About Multi-Image

Associations

Association for Educational Communications & Technology
1126 16th St. N.W.
Washington, D.C. 20036
(202) 833 4180

Association for Multi-Image
947 Old York Road
Abington, PA 19001
(215) 885 2050

Colleges and Universities

Arizona State University
Audiovisual Center
Tempe, Arizona 85281

Los Angeles Community College
855 N. Vermont Avenue
Los Angeles, California 90028

Rhode Island College
Audio Visual Department
600 Mt. Pleasant Avenue
Providence, Rhode Island 02908

Santa Fe Community College
3000 N.W. 83 Street
Gainesville, Florida 32601

Southwest Missouri State University
Director Media Productions
Springfield, Missouri 65802

Temple University
Educational Media Department
Philadelphia, PA 19122

University of Georgia
607 Aderhold Hall
Athens, Georgia 30602

University of South Carolina
Instructional Service Center
Law Center
Columbia, South Carolina 29208

Utah State University
1681 E. 1400 No.
Logan, Utah 84321

Colleges and Universities Offering Multi-Image Courses*

Arizona State University
Tempe, Arizona

California State College at Long Beach
Long Beach, California

San Diego State College
San Diego, California

San Jose State College
San Jose, California

University of Southern California
Los Angeles, California

Los Angeles Community College
Los Angeles, California

University of Connecticut
Storrs, Connecticut

Indiana State University
Terre Haute, Indiana

University of Iowa
Iowa City, Iowa

University of North Iowa
Cedar Falls, Iowa

University of Maryland
College Park, Maryland

Boston University
Boston, Massachusetts

University of Massachusetts
Amherst, Massachusetts

Western Michigan University
Kalamazoo, Michigan

University of Minnesota
Minneapolis, Minnesota

Teachers College
Columbia University
New York, N.Y.

Indiana University of Pennsylvania
Indiana, Pennsylvania

Santa Fe Community College
Gainesville, Florida

Temple University
Philadelphia, Pennsylvania

University of Texas
Austin, Texas

Brigham Young University
Provo, Utah

Utah State University
Logan, Utah

University of Wisconsin – Stout
Menominee, Wisconsin

*Prepared by James Maguire,
Austin Public Schools
Austin, Minnesota

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